Toshiba Personal Computer
Satellite L510

(PSLFx)

Maintenance Manual

TOSHIBA CORPORATION

S/ No

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Toshiba Satellite / Satellite Pro L510 / L515 / L517 Maintenance Manual

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Disclaimer

The information presented in this manual has been reviewed and validated for accuracy. The included set of instructions and descriptions are accurate for the Satellite / Satellite Pro L510 / L515 / L517 at the time of this manual's production. However, succeeding computers and manuals are subject to change without notice. Therefore, Toshiba assumes no liability for damages incurred directly or indirectly from errors, omissions, or discrepancies between any succeeding product and this manual.

Trademarks

Preface

This maintenance manual describes how to perform hardware service maintenance for the Toshiba Personal Computer Satellite / Satellite Pro L510 / L515 / L517, referred to as Satellite / Satellite Pro L510 / L515 / L517 in this manual.

The procedures described in this manual are intended to help service technicians isolate faulty Field Replaceable Units (FRUs) and replace them in the field.

SAFETY PRECAUTIONS

Four types of messages are used in this manual to bring important information to your attention. Each of these messages will be italicized and identified as shown below.

> ***DANGER:*** *"Danger" indicates the existence of a hazard that could result in death or serious bodily injury, if the safety instruction is not observed.*

> ***WARNING:*** *"Warning" indicates the existence of a hazard that could result in bodily injury, if the safety instruction is not observed.*

> ***CAUTION:*** *"Caution" indicates the existence of a hazard that could result in property damage, if the safety instruction is not observed.*

> ***NOTE:*** *"Note" contains general information that relates to your safe maintenance service.*

Improper repair of the computer may result in safety hazards. Toshiba requires service technicians and authorized dealers or service providers to ensure the following safety precautions are adhered to strictly.

- ❑ Be sure to fasten screws securely with the right screwdriver. If a screw is not fully fastened, it could come loose, creating a danger of a short circuit, which could cause overheating, smoke or fire.

- ❑ If you replace the battery pack, RTC battery or backup battery, be sure to use only the same model battery or an equivalent battery recommended by Toshiba. Installation of the wrong battery can cause the battery to explode.

The manual is divided into the following parts:

Chapter 1	Hardware Overview describes the Satellite / Satellite Pro L510 / L515 / L517 system unit and each FRU.
Chapter 2	Troubleshooting Procedures explains how to diagnose and resolve FRU problems.
Chapter 3	Test and Diagnostics describes how to perform test and diagnostic operations for maintenance service.
Chapter 4	Replacement Procedures describes the removal and replacement of the FRUs.
Appendices	The appendices describe the following:

- Handling the LCD module
- Board layout
- Pin Assignments
- Keyboard scan/character codes
- Key layout

Conventions

This manual uses the following formats to describe, identify, and highlight terms and operating procedures.

Acronyms

On the first appearance and whenever necessary for clarification acronyms are enclosed in parentheses following their definition. For example:

Read Only Memory (ROM)

Keys

Keys are used in the text to describe many operations. The key top symbol as it appears on the keyboard is printed in **boldface** type.

Key operation

Some operations require you to simultaneously use two or more keys. We identify such operations by the key top symbols separated by a plus (+) sign. For example, **Ctrl + Pause (Break)** means you must hold down **Ctrl** and at the same time press **Pause (Break)**. If three keys are used, hold down the first two and at the same time press the third.

User input

Text that you are instructed to type in is shown in the boldface type below:

DISKCOPY A: B:

The display

Text generated by the XXXXX that appears on its display is presented in the type face below:

```
Format complete
System transferred
```

Table of Contents

Chapter 1 Hardware Overview

Chapter 2 Troubleshooting

Chapter 3 Diagnostic Programs

Chapter 4 Replacement Procedures

Appendices

Chapter 1

Hardware Overview

Chapter 1 Contents

Figures

Tables

1.1 Features

The Toshiba Satellite / Satellite Pro L510 / L515 / L517 is a full size notebook PC based on the Intel Penryn processors, providing high-speed processing capabilities and advanced features. The computer employs a Lithium Ion battery that allows it to be battery-operated for a longer period of time. The display uses 14-inch LED HD panel. The Micro-FCPGA socket supports BTO for the CPU so that the system can be designed to suit your needs.

The computer has the following features.

- Processor

  The CPU is the Intel Processor.

  Core2 Duo Mobile Processor (1066MHz)

  P7350(2.0G) Hz

  Core2 Duo Mobile Processor (800MHz)

  T6500(2.1G) Hz

  Pentium Dual Core Processor (800MHz)

  T4200(2.0G)/T4300(2.1G) Hz

  Celeron Processor (800MHz)

  900(2.2G) Hz

- Host Bridge System Controller

  System Controller: Intel Cantiga GM45/GL40 + ICH9M

- Graphics

  Intel GL40 integrated and GM45 with ATI M92XT graphic.

- Memory

  The computer has two SO-DIMMs slot comes standard with DDRII-800MHz module. It supports PC2-6400 and uses SO-DIMMs (DDRII SDRAM) driven at 1.8 V, accepting BTO/CTO for your memory requirements. It can incorporate up to 8 GB of main memory.

  Using the following sizes of memory modules:

- 1024 MB (128M×64)/800 MHZ
- 2048 MB (256Mx64)/800 MHZ
- 4096 MB (512Mx64)/800 MHZ

❑ Hard Disk Drive (HDD)

The computer accommodate 9.5 mm height HDD with following storage capacities:

- 120 GB (9.5 mm thick) SATA (5,400rpm)
- 160 GB (9.5 mm thick) SATA (5,400rpm)
- 250 GB (9.5 mm thick) SATA (5,400rpm)
- 320 GB (9.5 mm thick) SATA (5,400rpm)
- 400 GB (9.5 mm thick) SATA (5,400rpm)
- 500 GB (9.5 mm thick) SATA (5,400rpm)

❑ ODD

The computer accommodates a fixed 12.7 mm SATA ODD with one of following types:

- DVD Super Multi +-R Double Layer drive
- DVD Super Multi +-R Double Layer with Label Flash

❑ Display

The LCD displays available come with one of following types:

- 14” Standard LED HD color display, resolution 1366×768

❑ Keyboard

The keyboard has 28 kinds’ countries key.

❑ Battery

The computer has a removable 6/12 Cell Lithium Ion battery pack.

❑ Universal Serial Bus (USB) Ports

The computer has two USB 2.0 ports and one eSATA/USB combo port. It is supported to daisy-chain a maximum of 127 USB devices. The serial data transfer rate is 480 Mbps or 12 Mbps and 1.5 Mbps. These ports support PnP installation and hot plugging.

- ❑ External Monitor Port

  A 15-pin external monitor port is provided, through which the computer automatically recognizes an external VESA DDC 2B compatible monitor.

- ❑ Multiple Digital Media Card Slot

  This computer is equipped with Multiple Digital Media Card Slot that can accommodate SD/ Mini-SD/ Micro-SD/ SD-IO/ SDHC/ MS/ MS Pro/ MMC/ XD memory cards. This slot is for your memory card requirements to provide memory card read on your computer

- ❑ Toshiba Pointing Device

  Toshiba Pointing Device has one kind of Normal touchpad only.

- ❑ Sound System

  The ALC272 integrated audio controller supports multimedia. The sound system contains the following:

  - Stereo speakers
  - Headphone jack
  - Internal microphone
  - External microphone jack

- ❑ LAN

  The internal LAN board supports 10/100Mbit , enabling connection to a LAN at up to 100Mbps. It also supports Wake-up on LAN from S3/S4/S5 and PXE boot support. The LAN board has RJ45 jack to directly accommodate a LAN cable.

- ❑ Wireless LAN

  The internal Mini Card slot supports IEEE802.11bg (MOW) / IEEE802.11abg (MOW)/ IEEE802.11abgn (MOW)/ IEEE802.11bgn (MOW) card. The Antenna has two or three wires dual band antenna support (depends on module).

- ❑ Internal Modem (BTO)

The computer contains a MDC, enabling data and fax communication. It supports ITU- T V.90 (for rest countries)/V.92 (America, Canada, UK, Germany & France). The transfer rates are 56 Kbps for data reception, 33.6 Kbps for data transmission and 14,400 bps for fax transmission. Note, however, that the actual speed depends on the line quality. The RJ11 modem jack is used to accommodate a telephone line.

- PCI Express Slot (BTO)

  The ICH9-M provides PCI Express root ports which are compliant to the PCI Express Base Specification, Revision 1.0a. The root port supports 2.5 Gb/s bandwidth in each direction (5 Gb/s concurrent) and two virtual channels for full isochronous data support.

- CD Key (BTO)

  The CD Key supports to play Audio CD directly.

- Internal Camera (BTO with Microphone)

  The computer has an internal camera. The camera has VGA (640*480) fixed focus.

- HDMI Out Port (BTO)

  A HDMI monitor can be connected to the HDMI out port on the computer.

  The computer has HDMI out port and support BTO.

- Bluetooth (BTO)

  Bluetooth wireless technology eliminates the need for cables between electronic device such as computers, printers and mobile phones.

- ❑ Figures 1-1/1-2/1-3 and 1-4 show the computer and its system unit configuration, respectively.

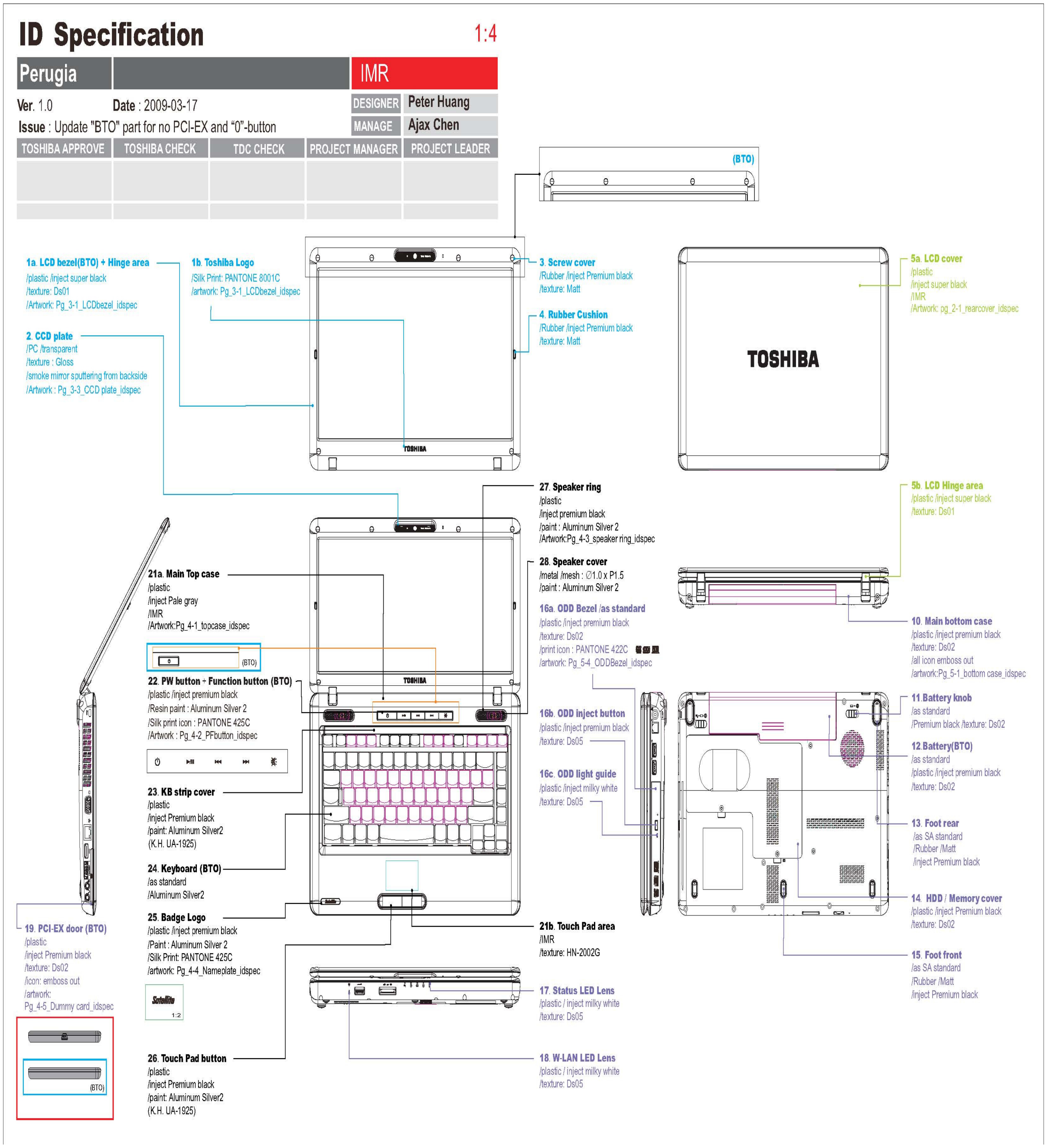


Figure 1-1 ID Parts Description Placement

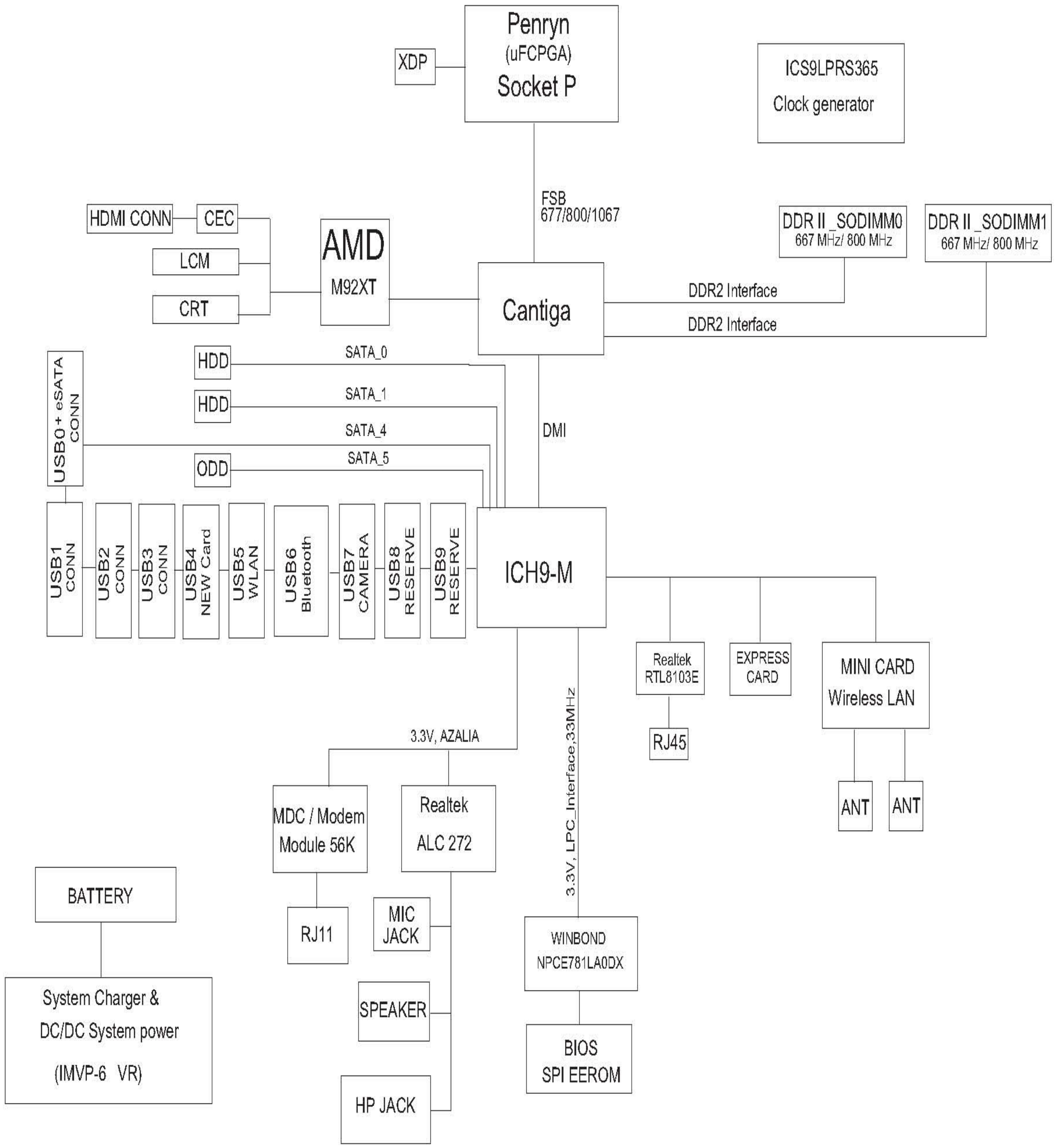


Figure 1-2 Computer Block Diagram

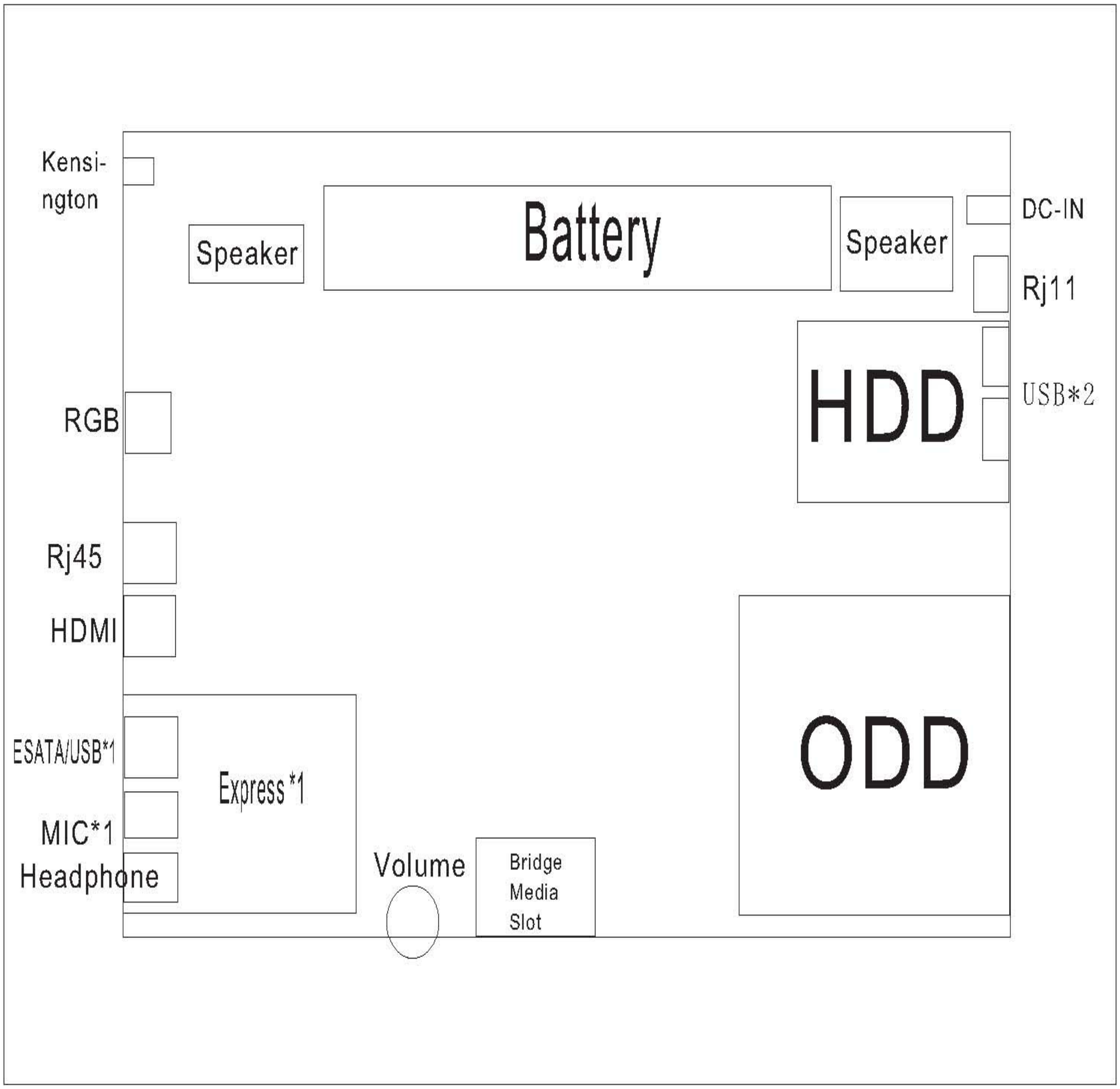


Figure 1-3 System Board Configurations

1.2 System Unit Components

Figure 1-4 is Block Diagram of the System Unit.

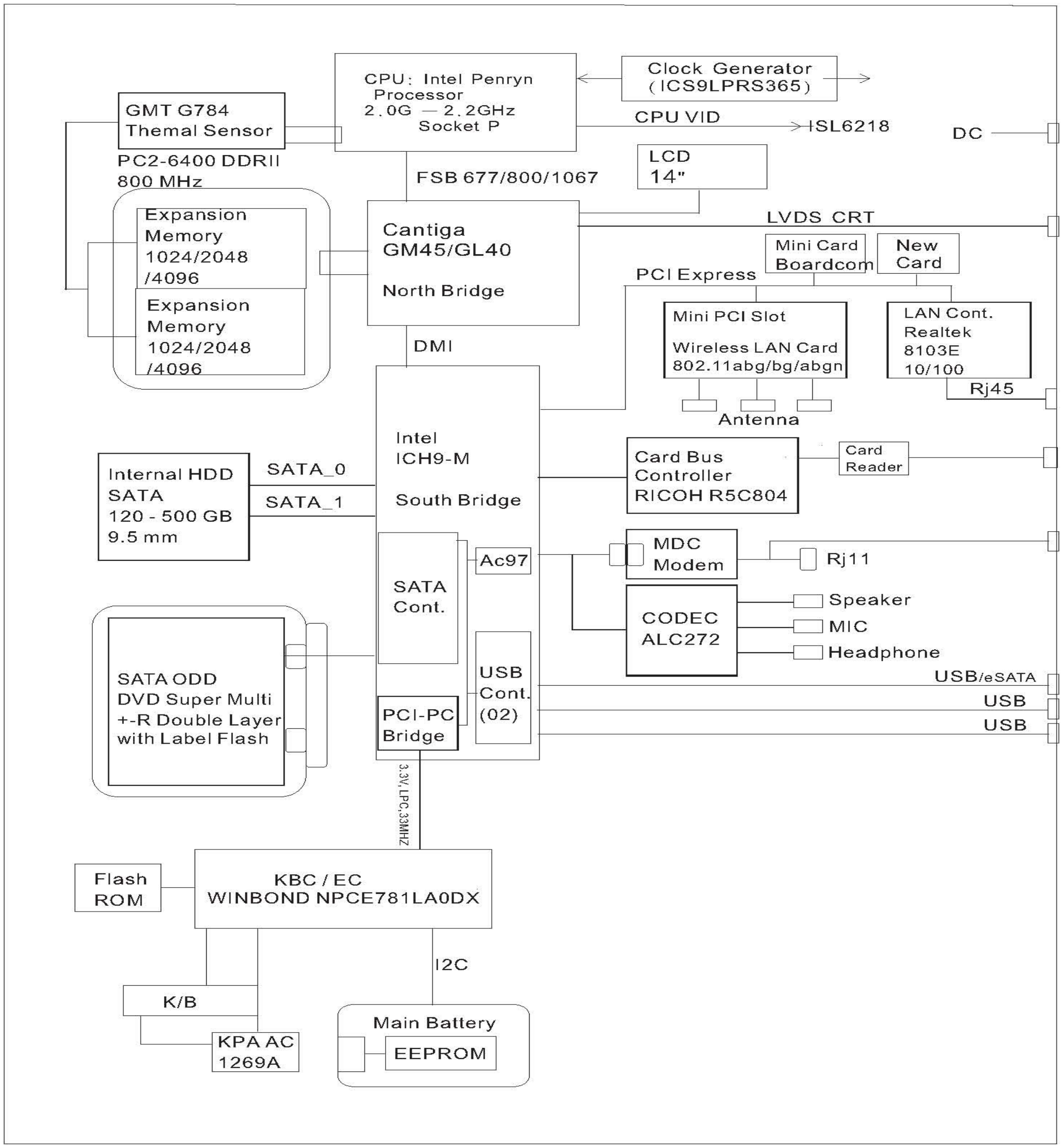


Figure 1-4 System Unit Block Diagram

The system unit of the computer consists of the following components:

- Processor: Core2 Duo Mobile and Core and Celeron Processor.

  - Core2 Duo Mobile Processor (1066MHz)
    - Core speed: 2.0GHz
    - System bus: 1066 MHz
    - On-die level 2 cache: 3 MB (P7350)

  - Core2 Duo Mobile Processor (800MHz)
    - Core speed: 2.1GHz
    - System bus: 800 MHz
    - On-die level 2 cache: 2 MB (T6500)

  - Pentium Dual Core Processor (800MHz)
    - Core speed: 2.0/2.1GHz
    - System bus: 800 MHz
    - On-die level 2 cache: 1 MB (T4200/T4300)

  - Celeron Processor (800MHz)
    - Core speed: 2.2GHz
    - System bus: 800 MHz
    - On-die level 2 cache: 1 MB (900)

- Memory

  Two expansion memory slots are provided. They can hold 1024/2048/4096MB expansion memory modules available as options to grow up to 8 GB.

  - PC2-6400(800MHZ)DDRII SDRAM supported
  - 1024/2048/4096MB modules supported
    - 1024 MB (128M x 64)
    - 2048 MB (256M x 64)
    - 4096 MB (512M x 64)
  - 1.8 volt operation
  - No parity bit
  - 64-bit data transfer

- BIOS ROM (Flash EEPROM)

- 8Mb x 1 chip (1024KB flash parts)
  - NvStorage size : 64K
  - NvStorage free space : 63K
  - FV00 size : 716K
  - FV00 free space : 61K
  - FV01 size : 128K
  - FV01 free space : 2K

❑ System Controllers

- North Bridge: Intel GM45/GL40
  - CPU Interface and Control
  - System Memory Support
  - PCI Express* Graphics (PEG) Interface
  - Integrated Display Interface Support
  - Internal Graphics Features
  - Direct Media Interface (DMI)
  - Power Management
  - Security and Manageability
  - Serial ATA Interface
  - ICH9 Audio Control

- South Bridge: Intel ICH9-M
  - Direct Media Interface (DMI)
  - PCI Express* Interface
  - Serial ATA (SATA) Controller
  - Advanced Host Controller Interface (AHCI)
  - Intel Matrix Storage Technology
  - PCI Bus Interface
  - Interrupt controller
  - Low Pin Count (LPC) Interface
  - Serial Peripheral Interface (SPI)
  - Compatibility Modules
  - Advanced Programmable Interrupt Controller (APIC)
  - Universal Serial Bus (USB) Controller
  - LAN Controller
  - RTC
  - GPIO
  - Enhanced Power Management
  - Intel I/O Virtualization (VT-d) Support
  - System Management Bus (SMBus 2.0)
  - Intel High Definition Audio Controller
  - Enhanced DMA Controller

- ❑ Card Bus Controller

  - R5C804
    - – PCI-1394 bridge interface
    - – SD/Mini SD/SD-IO/MS/MS Pro/MMC/XD Card Controller
    - – PCI Bus interface

- ❑ Audio Controller

  Realtek ALC272 integrated audio controller supports multimedia. The sound system feature contains the following:

  - 2 Stereo DACs support 16/20/24-bit PCM format for stereo audio playback.
  - 2 stereo ADCs support 16/20-bit PCM format for two stereo independent sound inputs.
  - 16/20/24-bit S/PDIF-OUT supports 44.1K/48K/88.2K/96K/192KHz sample rate.
  - All ADCs support 44.1K/48K/96KHZ sample rate.
  - 4 GPIOs(GPIO0/GPIO3 are digital GPIO shared with digital MIC interface, GPIO1/GPIO2 are analog) for customized applications.
  - High quality analog differential CD input.
  - 2 jack detection pins each designed to detect up to 4 jacks.
  - Supports hardware digital volume control for digital microphone input.
  - Supports external PCBEEP input and built-in digital BEEP generator.

    –

- ❑ KBC/EC (Keyboard Controller/Embedded Controller)

  A single KBC NPCE781LA0DX chip is used to serve as KBC/ EC and Super IO.

  - KBC
    - – Scan controller function
    - – Interface controller function
  - EC
    - – Power supply sequence control
    - – Overheat shutdown support
    - – LED control
    - – Beep control
    - – Device ON/OFF
    - – Cooling fan speed control
    - – Universal I/O port
    - – Battery capacity check
    - – Flash memory reprogramming function

– EC access interface
– I2C communication control

❑ Battery EEPROM

- 24C02 equivalent (128 words x 16 bits, I2C interface) integrated in battery pack.
  – Storing records of battery use

❑ Clock Generator

- ICS9LPRS365
  – Generating the clock signal required for the syste

❑ Modem Controller

Built-in MDC card with Askey / Foxconn. Functions of modem controller:

- Digital signal conductor protection
- Ring wake-up support
- Azalia interface
- Communication codes supported:
  – For data communication:
    V.90 (China)/V.92, data rates: 28kbps/56kbps
    V.34 extended rates: 33.6K/2400/V.32 turbo, V.32 bits and fallbacks
  – For fax:
    V.17, V.27, V.29, V.34 and V.21 Channel 2
    V.253 Class 1 fax

❑ LAN Controller

- Realtek 8103E 10/100Mbit
  – IEEE 802.3 10BASE-T/100BASE-TX compliant physical layer interface
  – IEEE 802.3u Auto-Negotiation support
  – Digital Adaptive Equalization control
  – 10BASE-T auto-polarity correction
  – LAN Connect interface
  – Automatic detection of “unplugged mode”
  – Remote boot (PXE 2.1)
  – Smart power down when link is not detected

❑ Wireless LAN Controller

- Support following 3 kinds of mini PCI wireless LAN cards

- IEEE 802.11bg
- IEEE 802.11abg
- IEEE 802.11abgn

- Data Rate
  - IEEE 802.11bg: Standard 54M bps
  - IEEE 802.11abg: Standard 54M bps
  - IEEE 802.11abgn: Standard 130M bps

- Frequency Channel
  - IEEE802.11bg: 2.4GHz
  - IEEE802.11abg: 2.4GHz / 5.4GHz
  - IEEE802.11abgn: 2.4GHz / 5.4GHz

1.3 2.5-inch HDD

The computer contains an extremely low-profile and lightweight, high-performance HDD. The HDD incorporates 9.5mm height magnetic disk and mini-Winchester type magnetic heads. The HDD interface conforms to Serial ATA. Storage capacities supported are 120, 160, 250, 320, 400,500 GB.

The HDD is shown in Figure 1-5 and some of its specifications are listed in Table 1-1.

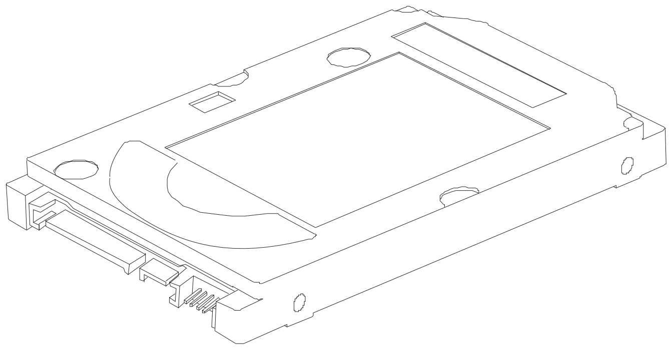


Figure 1-5 SATA HDD

Table 1-1 HDD Specifications

Item	Specifications		
Capacity (GB)	**120 GB**	**160 GB**	**250 GB**
Rotational Speed (RPM)	5400 rpm	5400 rpm	5400 rpm
Height	9.5 mm	9.5 mm	9.5 mm
User Data Sectors	234,442,648	312,581,808	488,397,168
Bytes / Sector	512	512	512
Item	**Specifications**		
Capacity (GB)	**320 GB**	**400 GB**	**500 GB**
Rotational Speed (RPM)	5400 rpm	5400 rpm	5400 rpm
Height	9.5 mm	9.5 mm	9.5 mm
User Data Sectors	625,142,488	781,422,768	976,773,168
Bytes / Sector	512	512	512

1.4 DVD Super Multi (+-R Double Layer)

The DVD Super Multi drive accepts 12-cm (4.72-inch) and 8-cm (3.15-inch) discs. At maximum, the drive can play back a DVD at 8x speed, read CD-ROM at 24x speed, and write CD-R at 24x speed, CD-RW at 4x speed, US CD-RW at 24x speed, High Speed CD-RW at 10x speed, DVD-R at 8x speed, DVD-RW at 6x speed, DVD+R at 8x speed, DVD+R (Double Layer) at 6x speed, DVD-R (Double Layer) at 6x speed, DVD+RW at 8x speed and DVD-RAM at 5x speed. The DVD interface conforms to Serial ATA.

The DVD Super Multi drive is shown in Figure 1-6 and its specifications are listed in Table 1-2.

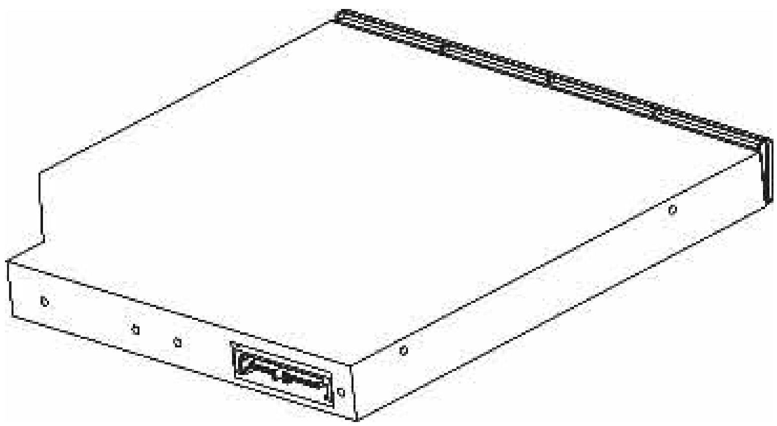


Figure 1-6 DVD Super Multi drive

Table 1-2 DVD Super Multi Drive Specifications

Item	DVD-ROM mode	CD-ROM mode
Data Transfer Rate (Mbytes/s)	33.3 (Ultra-DMA transfer mode 2) 16.7 (PIO mode 4, Multiword DMA mode 2)	
Access Time (ms)	180 ms	150 ms
Random Seek Time	150 ms	140 ms
Data Buffer Size (Mbytes)	2MB	
Formats Supported	DVD: DVD-VIDEO, DVD-ROM, DVD-R, DVD-RW, DVD-RAM, DVD+R, DVD+-R (Double Layer), DVD+RW. CD: CD-DA, CD-ROM, CD-R, CD-RW, Mixed-CD, HS CD-RW, US CD-RW, Photo CD (Multi-Session), Video CD, CD-Extra (CD+), CD-Text..	

1.5 Power Supply

The power supply unit provides many different voltages for the system board and performs the following functions:

1. Power input monitor
   - Checks whether the DC power supply (AC adapter) is connected to the computer.
   - Checks whether the battery pack is connected to the computer.
   - Monitors the DC power supply input voltage (AC Adapter output voltage).
2. Power supply's internal control
   - Turns on and off the battery pack charging power supply.
   - Issues a charging current instruction to the PWM control IC of the battery pack charging power supply.
   - Controls the supply of DC power supply input (AC Adapter output) to the power supply unit.
   - Controls the supply of power to the system block (load/logic circuit side).
   - Controls forced shutdown if the power supply malfunctions.
3. Logic circuit control
   - Instructs the gate array to enable/disable tuning the power on.
   - Controls power-on/off operation.
4. Status display
   - Turns on the Power LED (in Green or Umber blink).
   - Battery indicator (in Green or Umber blink).
5. External interface
   - Performs communication through the I2C bus (via the internal EC/KBC).
   - Transfers the power supply operation mode.
6. Output monitor
   - Monitors the voltage output to the system block (load/logic circuit side).
   - Monitors the voltage, over voltage, input/output current of the battery pack.
   - Monitors the internal temperature of the battery pack.
   - Monitors the supply voltage from the AC adapter.

1.6 Batteries

The computer has the following three types of batteries:

- ❑ Main Battery Pack
- ❑ Real Time Clock (RTC) Battery

Table 1-3 lists the specifications of these batteries.

Table 1-3 Battery specifications

Battery Type		Material	Output voltage	Capacity
Main Battery Pack	6 Cell	Lithium Ion	10.8 V	4000 mAh
	12 Cell	Lithium Ion	10.8 V	9000 mAh
RTC Battery		Lithium Ion	3.0 V	14 mAh

1.1.1 Main Battery

The main battery pack serves as the computer's main power source when the AC adapter is not attached. The main battery maintains the state of the computer so that it can resume it.

1.1.2 Battery Charging Control

Battery charging is controlled by WINBOND NPCE781LA0DX. When the AC adapter and battery pack are attached to the computer, the NPCE781LA0DX controls the charge on/off state and detects a full charge.

- ❑ Battery Charge

When the AC adapter is attached, the battery is charged by off-state charge when the system is powered off or by on-state charge when it is powered on.

Table 1-4 Quick/Normal charging time

State	Charge Time	
Off-State Charge	6/12 Cell	About 3 hours max
On-State Charge	6/12 Cell	About 3~10 hours max

> ***NOTE:*** *The time required for normal charge depends on the power consumption by the system. Using the fluorescent lamp and frequently accessing the disk consume much power and lengthen the charge time.*

Any of the following cases stops battery charge:

1. The battery becomes fully charged.
2. The AC adapter or battery pack is removed.
3. The battery or AC adapter voltage is abnormal.

❑ Detection of full charge

A full charge is detected only when the battery is being charged by quick or normal charge. A full charge is detected when either of the following conditions is met:

1. The current in the battery charging circuit drops below the predetermined value.
2. The charging time exceeds the fixed limit.

1.1.3 RTC Battery

The RTC battery provides power to keep the current date, time and other system information in memory while the computer is turned off.

Chapter 2

Troubleshooting

Chapter 2 Contents

Figures

Tables

2.1 Outline

This chapter describes the fault diagnosis procedures for field replaceable units (FRUs) in the computer.

The FRUs covered here are as follows:

1. System board	2. HDD	3. Keyboard
4. Display	5. ODD drive	6. LAN
7. Speaker	8. Cooling module	

See Chapter 4 for the procedures to replace FRUs and Chapter 3 for the procedures to use test programs

The following tools are required to perform the diagnostic procedures:

1. Diagnostics (maintenance test program) disk
2. Phillips screwdrivers (2 mm, 2.5 mm)
3. Cleaning disk kit (for ODD drive cleaning)
4. Bootable CD
5. Multi-meter
6. External monitor
7. Headphone
8. Microphone
9. A-BEX TEST DVD
10. Music CD
11. DVD TSD-1 (TOSHIBA EMI DVD Test Media)

2.2 Basic Flowchart

The basic flowchart in Figure 2-1 serves as a guide for identifying a possibly faulty FRU.

Before going through the diagnostic flowchart steps, verify the following:

- ❑ Ask the user if a password has been registered and, if so, ask him or her to enter the password. If the user has forgotten the system password, use a jump wire to make a short circuit on M/B **B500** location, then turn the computer power on. When booted, the computer overrides password protection and automatically erases the current password.
- ❑ Make sure the Windows® Vista Home Edition has been installed on the HDD. Any other operating system can cause the computer to malfunction.
- ❑ Make sure any piece of optional equipment has been installed.

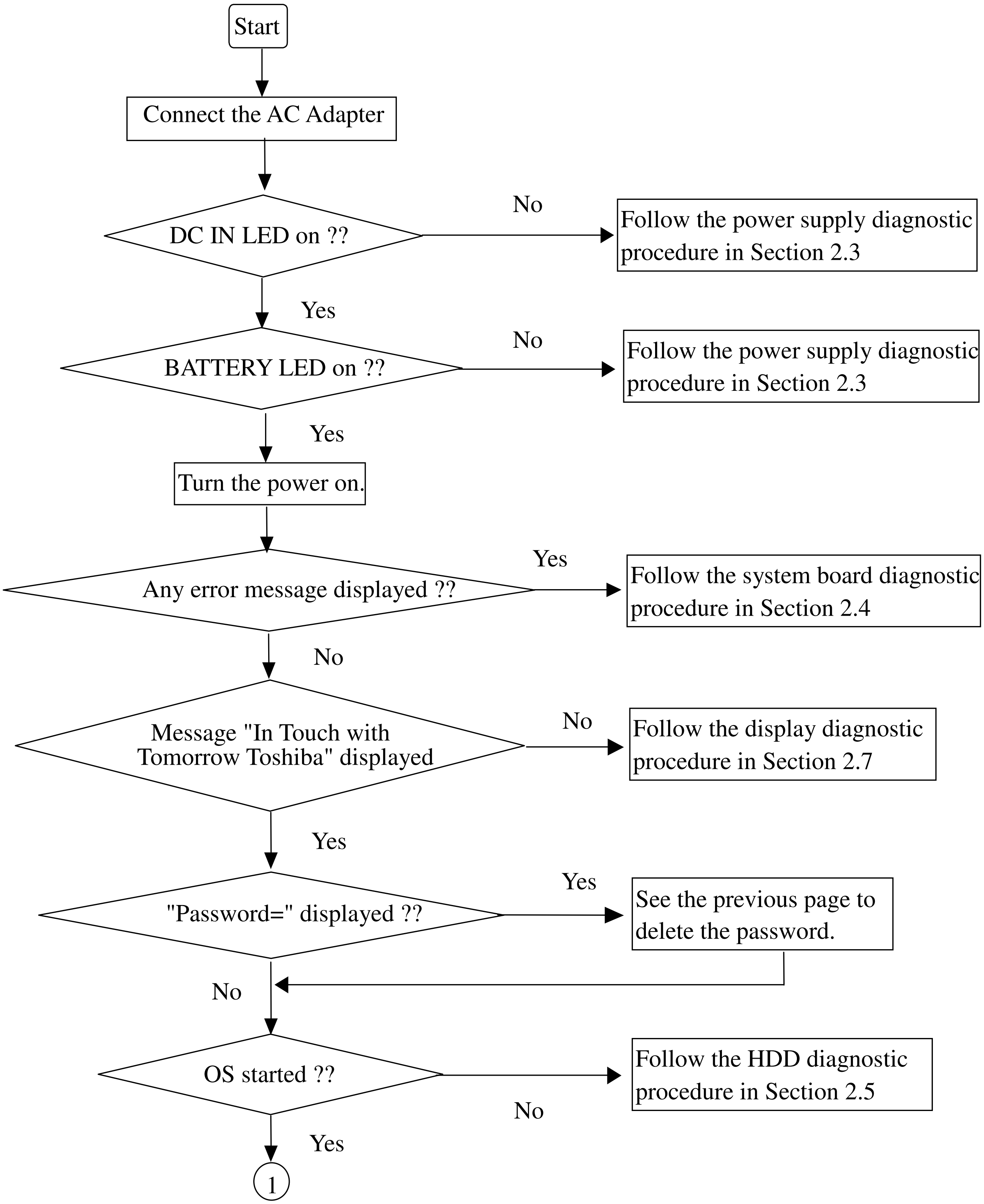


Figure 2-1 Basic flowchart(1/2)

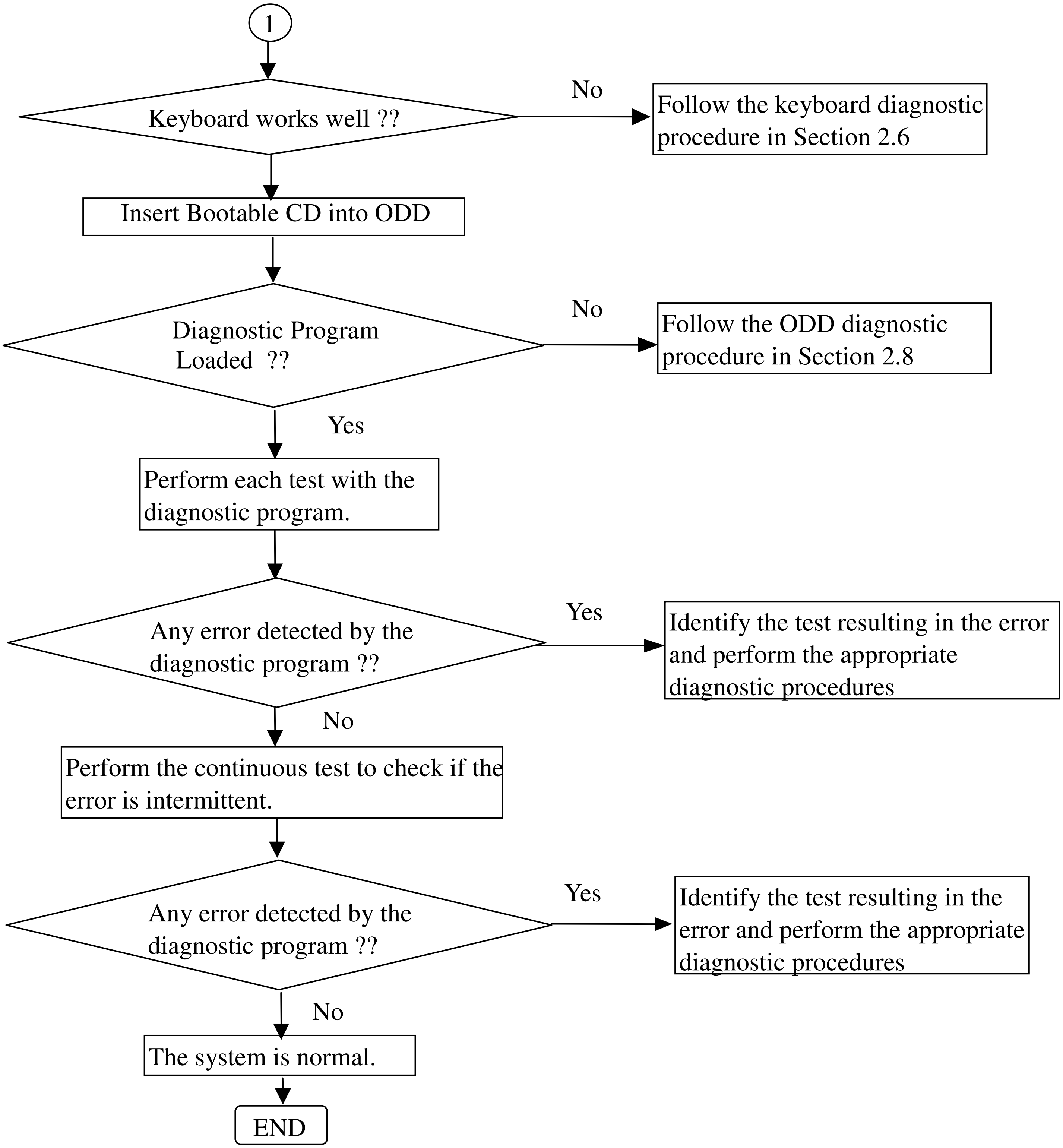


Figure 2-1 Basic flowchart (2/2)

If the diagnostic program cannot detect an error, the error may be intermittent. Run the continuous test program repeatedly to isolate the problem. Check the log utilities function to confirm which diagnostic test detected the error, then perform the appropriate troubleshooting procedures as follows:

1. If an error is detected by the System test, Memory test, A sync test, Printer test, Sound test, or Real Timer test, follow the system board troubleshooting procedures in Section 2.4.
2. If an error is detected by the Hard Disk test, follow the HDD troubleshooting procedures in Section 2.5.
3. If an error is detected by the Keyboard test, follow the keyboard troubleshooting procedures in Section 2.6.
4. If an error is detected by the Display test, follow the display troubleshooting procedures in Section 2.7.
5. If an error is detected by the ODD test, follow the ODD troubleshooting procedures in Section 2.8.
6. If an error is detected by the LAN test, follow the LAN troubleshooting procedures in section 2.9.
7. If an error is detected by the Speaker test, follow the Speaker troubleshooting procedures in section 2.10.
8. If an error is detected by the Fan On/Off test, follow the cooling module trouble shooting procedures in Section 2.11.

2.3 Power Supply

The power supply in the computer controls many functions and components. To check if the power supply is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 Power Icon Check

Procedure 2 Connection Check

Procedure 3 Replacement Check

Procedure 1 Power Icon Check

The following two power LEDs indicate the power supply status:

- ❑ Battery LED
- ❑ DC IN LED

The power supply controller displays the power supply status through the Battery and DC IN LEDs as in the tables below.

- ❑ Battery LED

Battery LED	Power supply status
On in Umber	Battery being charged
On in Green	Battery fully charged, with AC adapter connected
Blinking in Umber (at equal intervals)	Battery low *1 while driving the computer
Off	Else

- ❑ DC IN LED

DC IN LED	Power supply status
On in Green	DC power being supplied (from the AC adapter)
Off	Battery damage and can't charge during DC-in.
Off	Else

If the DC IN LED off, follow the steps below:

1. Remove the battery pack and the AC adapter to shut off power supply to the computer.
2. Attach the battery and AC adapter back again.

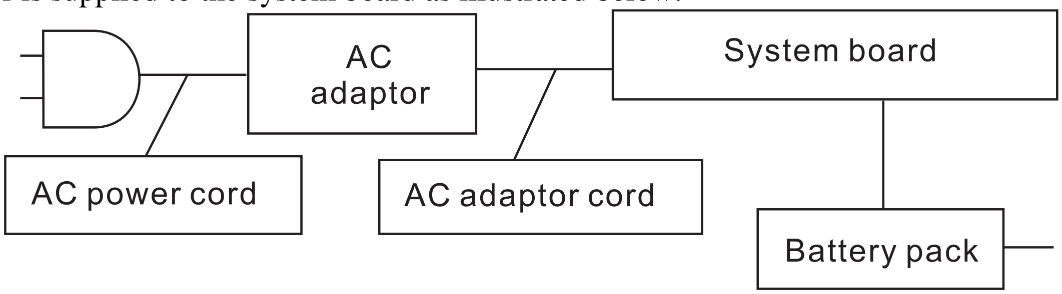
If the LED still off, follows the steps below:

Check 1 Make sure the DC IN LED goes on in Green. If it does not, go to Procedure 2.

Check 2 Make sure the Battery LED goes on in Umber or Green. If it does not, go to Procedure 3.

Procedure 2 Connection Check

Power is supplied to the system board as illustrated below:



Follow the steps below to check whether each connector has been connected correctly:

Check 1 **Make sure the AC adaptor and AC power cord have been firmly plugged into the DC IN socket and wall outlet, respectively. When they have been connected correctly, perform Check 2.**

Check 2 **Connect a new AC adaptor and AC power cord.**

- If the DC IN LED does not go on, go to Procedure 3.
- If the battery LED does not go on, perform Check 3.

Check 3 **Make sure the battery pack has been correctly installed in the computer. If the battery LED does not go on while the battery pack has been installed correctly, go to Procedure 3.**

Procedure 3 Replacement Check

The system board, power supply board, or CPU may be faulty. Disassemble the computer according to Chapter 4 and follow the steps below:

Check 1 **Replace the power supply board with a new one. If the battery pack is still not working properly, perform Check 2.**

Check 2 **Replace the system board with a new one. If the battery pack is still not working properly, perform Check 3.**

Check 3 **Replace the CPU with a new one.**

2.4 System Board

To check if the system board is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 Message Check

Procedure 2 Test Program Check

Procedure 3 Replacement Check

Procedure 1 Message Check

When the power is turned on, the system performs the self-diagnostic Power On Self Test (POST) embedded in the BIOS ROM. The POST tests and initializes each IC on the system board.

- If an error message appears on the display, perform Check 1.
- If there is no error message, go to Procedure 2.
- If FREE-DOS or Windows Vista Home Edition is loaded normally, go to Procedure 3.

Check 1 **If the following error message is displayed on the screen, press the F1 key as prompted. These errors occur when the system configuration preserved in the RTC memory (generally called CMOS memory) does not match the actual configuration or when the data is lost.**
If you press the F1 key as prompted by the message, the SETUP screen appears to set the system configuration. If the error message appears frequently when the power is turned on, replace the RTC battery. If any other error message is displayed, perform Check 2.

```
*** Bad RTC battery ***
Check system.  Then press [F1] key
```

Check 2 **If the following error message is displayed on the screen, press any key as prompted by the message.**
The error message appears when either data stored in RAM to be resumed is lost because the battery has been exhausted or the system board is faulty. If any other error message displays, perform Check 3.

Check 3 **Resume failure and press any key to continue.**

Procedure 2 Test Program Check

The maintenance test program contains several programs for diagnosing the system board and CPU. Execute the following test programs using the procedures described in Chapter 3.

1. System test
2. Memory test
3. Keyboard test
4. Display test
5. Hard Disk test
6. Mouse test
7. ODD test
8. Sound test
9. LAN test

If an error is detected during these tests, go to Procedure 3.

Procedure 3 Replacement Check

The system board, memory, or CPU may be defective. Disassemble the computer following the steps described in Chapter 4 and replace the system board, memory module or CPU with a new one.

2.5 HDD

To check if the 9.5mm HDD is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 Message Check

Procedure 2 Partition Check

Procedure 3 Format Check

Procedure 4 Test Program Check

Procedure 5 Connector Check and Replacement Check

> ***CAUTION:*** *The contents of the HDD will be erased when the HDD diagnostic test or formatting is executed. Save the required contents of the HDD to floppy disks or other storage drive in advance.*

Procedure 1 Message Check

When the computer's HDD does not function properly, some of the following error messages may appear on the display. Follow the steps below to check the HDD.

Check 1 **If either of the following messages appears, go to Procedure 2. If the following messages do not appear, perform Check 3.**

```
Insert system disk in drive
Press any key when ready .....
or
Non-System disk or disk error
Replace and press any key
```

Check 2 **Check TSETUP to see if the Hard Disk option has been set to "Not used". If so, choose another setting and restart the computer. If the problem persists, go to Procedure 2.**

Procedure 2 Partition Check

Boot from the DOS system. Perform the following checks:

Check 1 **Type C: and press the Enter key. If you cannot change to drive C, perform Check 2. If you can change to drive C, perform Check 3.**

Check 2 **Type FDISK and press the Enter key. Choose "Display partition information" from the FDISK menu. If drive C is listed, perform Check 3. If drive C is not listed, return to the FDISK menu and choose the option to**

create a DOS partition on drive C. Then restart the computer.. If the problem persists, go to Procedure 3.

Check 3 **If drive C is listed as active in the FDISK menu, perform Check 4. If drive C is not listed as active, return to the FDISK menu and choose the option to set the active partition for drive C. Then restart the computer. If the problem persists, perform Check 4.**

Check 4 **Enter DIR C: and press the Enter key. If the following message is displayed, go to Procedure 3. If contents of drive C are listed on the display, perform Check 5.**

```
Invalid media type reading drive C
Abort, Retry, Fail?
```

Check 5 **Use the SYS command in the DOS system to install system files. If the following message appears on the display, the system files have been transferred to the HDD. Restart the computer. If the problem persists, go to Procedure 3.**

```
System transferred
```

> ***NOTE**: If the computer is running Windows Vista Home edition and the hard disk capacity is more than 512 MB, the FDISK program will ask if you need support for a partition larger than 2 GB. Select Y for large partition support; however, be sure to read the precaution regarding access by other operating systems.*

Procedure 3 Format Check

The 2.5-inch HDD is formatted using the low-level format program and the FREE-DOS FORMAT program. Using these programs, follow the steps below to format the HDD.

Check 1 **Enter FORMAT C:/S/U to format the HDD and transfer system files. If the following message appears on the display, the HDD has been formatted.**

```
Format complete
```

If you cannot format the HDD using the test program, go to Procedure 4.

Procedure 4 Test Program Check

Run the HDD test program stored on the maintenance test program disk for all test items. See Chapter 3 for details on how to use the test program.

If an error is detected during the HDD test, an error code and status will be displayed. The error codes and their status names are listed in Table 2-1. If an error code is not generated and the problem still exists, go to Procedure 5.

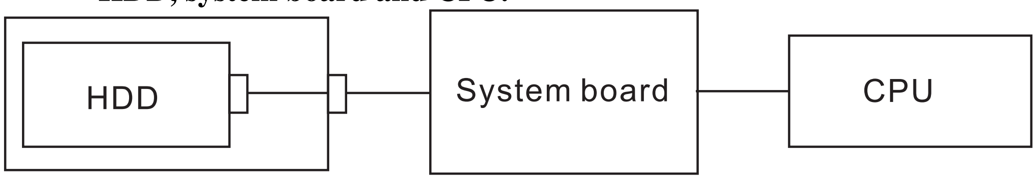
Table 2- 1 HDD error code and status

Code	Status
1	Get Parameter Fail !
2	Read Old Data Error
3	Write Pattern Error
4	Read Back Data Error
5	Data Compare Error
6	Restore Data Error
7	Read Verify Error
9	Seek Error
10	Disk Controller Self Test Failed
11	Disk Controller Test unexpected interrupt Failed
12	Disk Controller action Test Failed
13	Disk dos not support SMART
14	Disk read attribute threshold error
15	Disk read attribute value error
16	Disk SMART attribute value error

Procedure 5 Connector Check and Replacement Check

The HDD or system board may be faulty. Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 **Make sure the following connectors have been firmly connected to the HDD, system board and CPU.**



If any connector is loose or off, reconnect it firmly and return to Procedure 1.
If there is still an error, perform Check 2.

Check 2 **The HDD may be damaged. Replace it with a new one following the disassembling instructions in Chapter 4. If the problem persists, perform Check 3.**

Check 3 **The System board may be damaged. Replace it with a new one following the disassembling instructions in Chapter 4. If the problem persists, perform Check 4.**

Check 4 **The CPU may be damaged. Replace it with a new one following the disassembling instructions in Chapter 4.**

2.6 Keyboard

To check if the computer's keyboard is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 Test Program Check

Procedure 2 Connector Check and Replacement Check

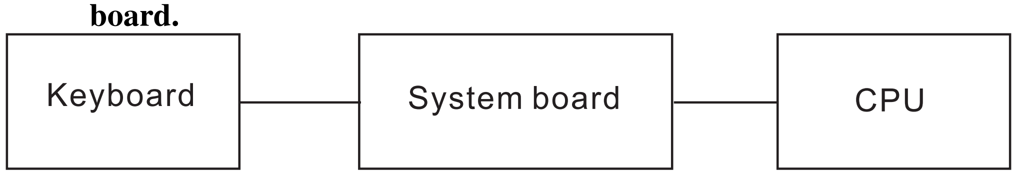
Procedure 1 Test Program Check

Execute the Keyboard test available as part of the maintenance test program. See Chapter 3 for information on how to perform the test.
If an error is detected in the test, go to Procedure 2. If no error is detected, the keyboard itself is normal.

Procedure 2 Connector Check and Replacement Check

The keyboard or system board may be disconnected or faulty. Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 **Make sure the keyboard cable has been firmly connected to the system board.**



If the cable is loose or off, reconnect it firmly and return to Procedure 1. If there is still an error, perform Check 2.

Check 2 **The keyboard may be faulty. Replace it with a new one following the instructions in Chapter 4. If the problem persists, perform Check 3.**

Check 3 **The System board may be faulty. Replace it with a new one following the instructions in Chapter 4. If the keyboard is still not functioning properly, perform Check 4.**

Check 4 **The memory may be defective. Replace the memory module with a new one following the steps described in Chapter 4. If the problem persist, perform Check 5.**

Check 5 **The CPU may be faulty. Disassemble the computer following the steps described in Chapter 4 and replace the CPU with a new one.**

2.7 Display

To check if the computer's display is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 External Monitor Check

Procedure 2 Test Program Check

Procedure 3 Connector Check and Replacement Check

Procedure 1 External Monitor Check

Connect an external monitor to the computer's external monitor port, then boot the computer. The computer automatically detects the external monitor even if resume mode is enabled.
If the external monitor works correctly, the internal LCD, LCD/FL cable, or FL may be faulty. Go to Procedure 3.
If the external monitor appears to have the same problem as the internal monitor, the system board may be faulty. Go to Procedure 2.

Procedure 2 Test Program Check

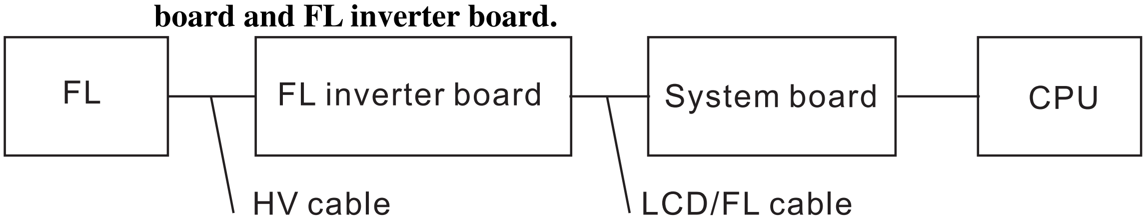
Insert the diagnostics bootable CD in the computer's CD ROM, turn on the computer and run the test. See Chapter 3 for information on how to perform the test.
If an error is detected in the test, go to Procedure 3. If no error is detected, the display itself is normal.

Procedure 3 Connector Check and Replacement Check

The display unit has an LCD module, Fluorescent lamp (FL), panel close switch and FL inverter board. Any of the components or their connections may be defective. Disassemble the computer following the steps described in Chapter 4, then perform the following checks:

(1) If the FL does not light, perform Check 1.
(2) If characters or graphics are not displayed normally, perform Check 5.
(3) If the FL remains lit when the display is closed, the panel close switch may be defective. Perform Check 8.

Check 1 **Make sure the following cables have been firmly connected to the system board and FL inverter board.**



If any of the cables is loose or off, reconnect it firmly and return to Procedure 3. If there is still an error, perform Check 2.

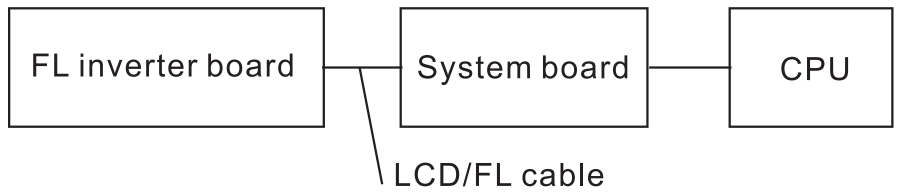
Check 2 **The LCD/FL cable may be faulty. Replace it with a new one and return to Procedure 3. If there is still an error, perform Check 3.**

Check 3 **The FL may be faulty. Replace it with a new one and return to Procedure**

3. If there is still an error, perform Check 4.

Check 4 **The FL inverter board may be faulty. Replace it with a new one and return to Procedure 3. If there is still an error, perform Check 5.**

Check 5 **Make sure the LCD/FL cable has been firmly connected to the system board and LCD module.**



If the cable is loose or off, reconnect it firmly and return to Procedure 3. If there is still an error, perform Check 6.

Check 6 **The LCD/FL inverter cable may be faulty. Replace it with a new one and return to Procedure 3. If there is still an error, perform Check 7.**

Check 7 **The LCD module may be faulty. Replace it with a new one and return to Procedure 3. If there is still an error, perform Check 8.**

Check 8 **The System board may be faulty. Replace it with a new one. If there is still an error, perform Check 9.**

Check 9 **The CPU may be faulty. Replace it with a new one following the instructions in Chapter 4.**

Check 10 **The memory may be defective. Replace the memory module with a new one following the steps described in Chapter 4. If the problem persists, perform Check 10.**

2.8 ODD (Optical Disk Drive)

To check if the internal ODD drive is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 ODD Cleaning Check

Procedure 2 Test Program Check

Procedure 3 Connector Check and Replacement Check

Procedure 1 ODD Cleaning Check

1. Turn off the power to the computer.
2. Open the ODD tray by inserting a slender object such as a straightened paper clip into the eject hole. The object must be long enough to activate the eject mechanism.
3. Clean the laser pickup lens with a lens cleaner. Apply the cleaner to a cloth and wipe the lens.
4. If the ODD drive still does not function properly after cleaning, go to Procedure 2.

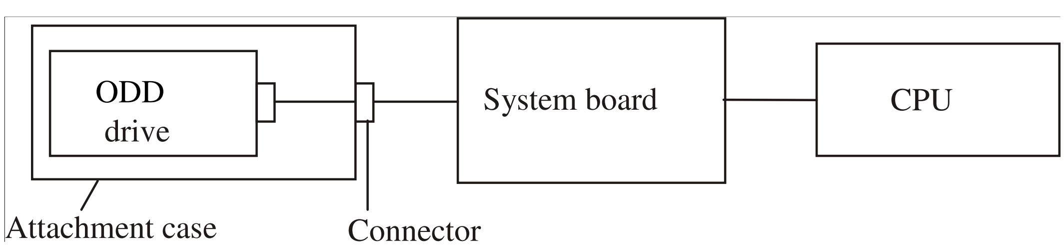
Procedure 2 Test Program Check

Execute the ODD drive test program available as part of the maintenance test program. Insert the diagnostics CD in the computer's CD, turn on the computer and run the test. Then insert a test ODD (Toshiba-EMI DVD-ROM TEST DISK TSD-1) into the ODD drive. See Chapter 3 for information on how to perform the test.
If any error is detected by the test, go to Procedure 3.

Procedure 3 Connector Check and Replacement Check

The ODD drive is connected to the system board by the connector. The connector may be disconnected from the system board or faulty. Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 Make sure the following connector has been firmly connected to the ODD drive and the system board.



If the connector is loose or off, reconnect it firmly and return to Procedure 2.
If there is still an error, perform Check 2.

Check 2 The connector may be faulty. Replace the connector with a new one following the steps in Chapter 4. If the ODD drive is still not functioning properly, perform Check 3.

Check 3 **The ODD drive may be faulty. Replace the ODD drive with a new one following the steps in Chapter 4. If the ODD drive is still not functioning properly, perform Check 4.**

Check 4 **The system board may be faulty. Replace it with new one following the instructions in Chapter 4. If the ODD drive is still not functioning properly, perform Check 5.**

Check 5 **The memory may be defective. Replace the memory module with a new one following the steps described in Chapter 4. If the problem persists, perform Check 6.**

Check 6 **The memory may be defective. Replace the memory module with a new one following the steps described in Chapter 4. If the problem persists, perform Check 3.**

2.9 LAN

To check if the computer's LAN is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 Test Program Check

Procedure 2 Connector Check and Replacement Check

Procedure 1 Test Program Check

Execute the LAN check program available as part of the maintenance test program. This program will check the LAN. Insert the Bootable CD into the CD. Turn on the computer and run the check program. See Chapter 3 for information on how to perform the check. If any abnormal is detected by the check, go to Procedure 2

Procedure 2 Connector Check and Replacement Check

The LAN connector (RJ45) is mounted on the system board. If the LAN malfunctions, the system board or CPU might be faulty.

Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 **The system board may be faulty. Replace it with a new one following the instructions in Chapter 4. If the LAN is still not functioning properly, perform Check 2.**

Check 2 **The memory may be defective. Replace the memory module with a new one following the steps described in Chapter 4. If the problem persists, perform Check 3.**

Check 3 **The CPU may be faulty. Disassemble the computer following the steps described in Chapter 4 and replace the CPU with a new one.**

2.10 Audio Test

To check if the computer's Speaker is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 Test Program Check

Procedure 2 Connector Check and Replacement Check

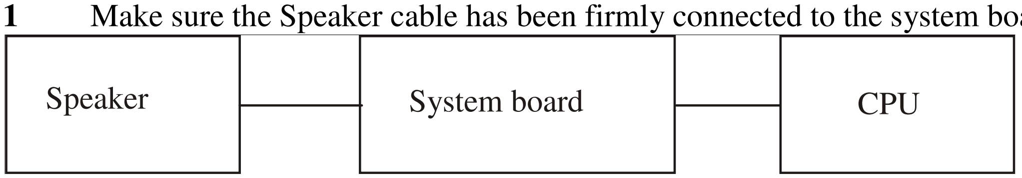
Procedure 1 Test Program Check

Execute the Audio test available as part of the maintenance test program. See Chapter 3 for information on how to perform the test.
If an error is detected in the test, go to Procedure 2. If no error is detected, the Audio itself is normal.

Procedure 2 Connector Check and Replacement Check

The Audio or system board may be disconnected or faulty. Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 Make sure the Speaker cable has been firmly connected to the system board.



If the cable is loose or off, reconnect it firmly and return to Procedure 1. If there is still an error, perform Check 2**.**

Check 2 The Speaker may be faulty. Replace it with a new one following the instructions in Chapter 4. If the problem persists, perform Check 3.

Check 3 The System board may be faulty. Replace it with a new one following the instructions in Chapter 4. If the Audio is still not functioning properly, perform Check 4.

Check 4 The memory may be defective. Replace the memory module with a new one following the steps described in Chapter 4. If the problem persist, perform Check 5.

Check 5 The CPU may be faulty. Disassemble the computer following the steps described in Chapter 4 and replace the CPU with a new one.

2.11 Cooling Module

To check if the computer's cooling module is defective or malfunctioning, follow the troubleshooting procedures below as instructed.

Procedure 1 Test Program Check

Procedure 2 Connector Check and Replacement Check

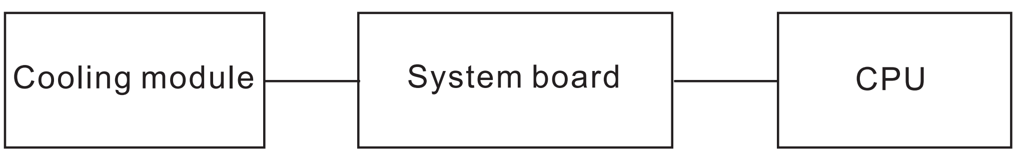
Procedure 1 Test Program Check

Execute the Fan On/off test program available as part of the maintenance test program. This test program checks the cooling module. Insert the diagnostics bootable CD in the computer's CD, turn on the computer and run the test. See Chapter 3 for information on how to perform the test.
If any error is detected by the test, go to Procedure 2.

Procedure 2 Connector Check and Replacement Check

The cooling module is connected to the system board. If the cooling module malfunctions, there may be a bad connection between the cooling module and the system board or either might be faulty.
Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 **Make sure the cooling module has been firmly connected to the connector on the system board. Also make sure that the tape is not stuck to any part of the fan and that the fan is free of foreign matter.**



If the connector is disconnected, connect it firmly to the system board and return to Procedure 1. If the tape is stuck to any part of the fan, stick it back to the specified point. If a foreign matter is found in the fan, remove it and then return to Procedure 1. If there is still an error, perform Check 2.

Check 2 **The cooling module may be faulty. Replace it with a new one following the steps in Chapter 4. If the cooling module is still not functioning properly, perform Check 3.**

Check 3 **The memory may be defective. Replace the memory module with a new one following the steps described in Chapter 4. If the problem persists, perform Check 4.**

Check 4 **The CPU may be faulty. Disassemble the computer following the steps described in Chapter 4 and replace the CPU with a new one.**

Chapter 3

Diagnostic Programs

Chapter 3 Contents

3.1 General

This chapter explains the diagnostic programs which tests and diagnoses the functions of the hardware components of this computer. The diagnostic programs can be classified into two types: OPTION and DIAGNOSTIC TEST.

> ***NOTE 1:*** *This Diagnostic supports Perugia10M/10MG*
>
> ***NOTE 2:*** *Before test must set SATA Controller Mode to "Compatibility" in BIOS Advanced setting, when finished test set it to "AHCI"*
>
> ***NOTE 3:*** *Before running a test, be sure to:*
>
> *1. Check that all the cables are connected securely.*
>
> *2. Exit the application that is currently running and close Windows.*

The OPTION includes the following functions:

- Select All Items
- Test Select Items
- Edit Batch Parameters
- Load Batch Parameters
- Save Batch Parameters
- Log Parameters
- Specify Log Viewer
- Display Error Log File
- DOS Shell
- Exit to Free-DOS

The DIAGNOSTIC TEST Devices include the following tests:

- System Test
- Memory Test
- Storage Test
- Video Test
- Communication Test
- Peripheral Test
- Keyboard Layout Test
- Hot Key Test
- Audio Play Test
- Audio Record Test
- DMI Read
- DMI Write
- System Information

Before running the diagnostic programs, get the following tools prepared:

- A Service Diagnostic BOOT CD
- A Formatted FLOPPY DISK
- A Test Media CD (A-BEX TEST CD-ROM TCDR-702)(for CD-ROM test)
- A Test Media DVD (Toshiba-EMI DVD-ROM TEST DISK TSD-1)
- An External Monitor (for DISPLAY test)
- A CD-ROM Driver (for CD-ROM test)
- Audio Line for audio record test
- A Data CD (for CD-ROM test)

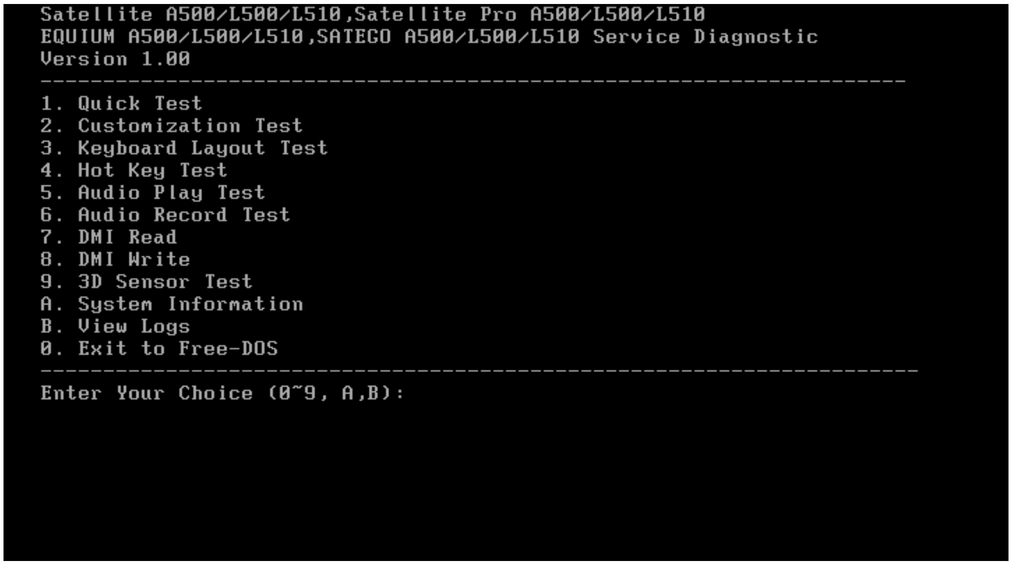
The following chapters describe all the test details. The test items could be selected from the DIAGNOSTIC TEST menu.

Note:

When booting up the unit for the first time, the system will automatically select the location of the result log file. If a USB floppy drive is connected, and there is an unprotected floppy diskette with more then 50KB spare space in the drive, system will save all log files into the root directory the diskette; otherwise, system will save all log files in the root directory of RAM disk.

3.2 Quick Start

When the system is booting from Service Diagnostic CD, the following screen will be displayed:



Please select a test item or select **0** to exit to Free-DOS:

3.2.1 Quick Test

When this item is selected, the system will run the configured test items and generate a test report automatically.

When the test is completed, a file named Quick.log would be saved in the defined location.

When Quick.log is being created, meanwhile, a file named quick.log has already existed, the system will automatically rename Quick.log to Quick. old for the backup purpose of the log file.

For the detail of test item, please refer to Quick Test Item List.

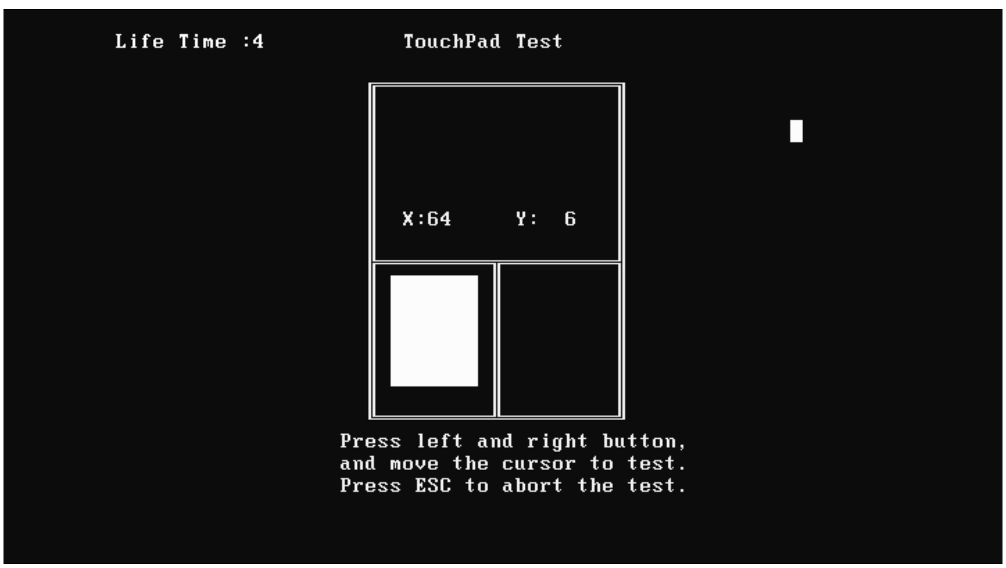
3.2.2 Customization Test

When this item is selected, the system will run the diagnostic programs according to the procedures you defined. When the test is completed, a file named Custom.log will be saved in the defined location. Please see the following example-- Mouse test.

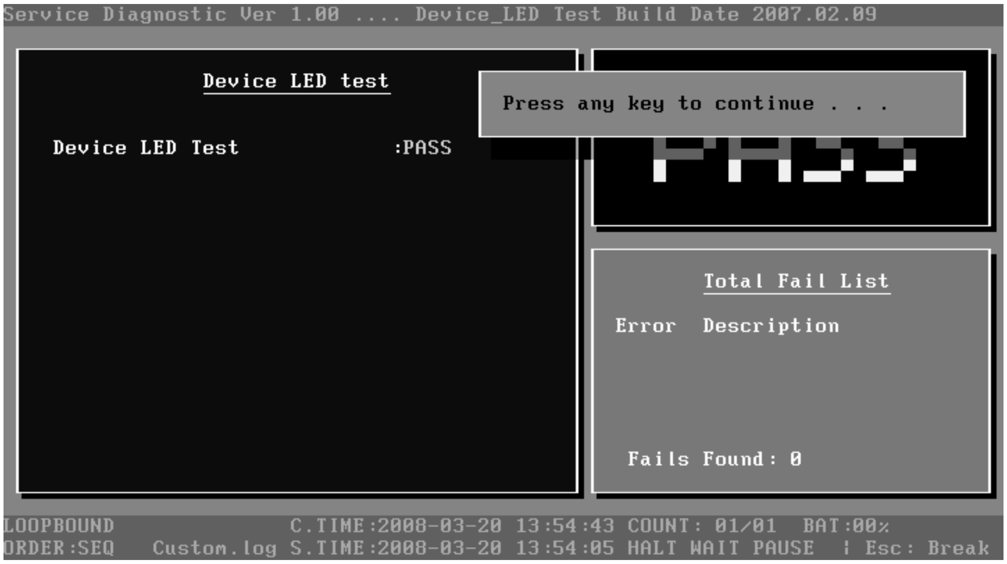
1. Use arrow key to select ‘TouchPad’ item on ‘Peripheral’ in the menu, then press **Space** key to select it. (When it is being selected, there is a **X** marked in the [ ])



Select 'Test Mouse' or press **F8** to run the test. The prompt information would be displayed in the screen as below. This test item needs user to verify whether the mouse works normally.



The test result will be displayed in the following screen:

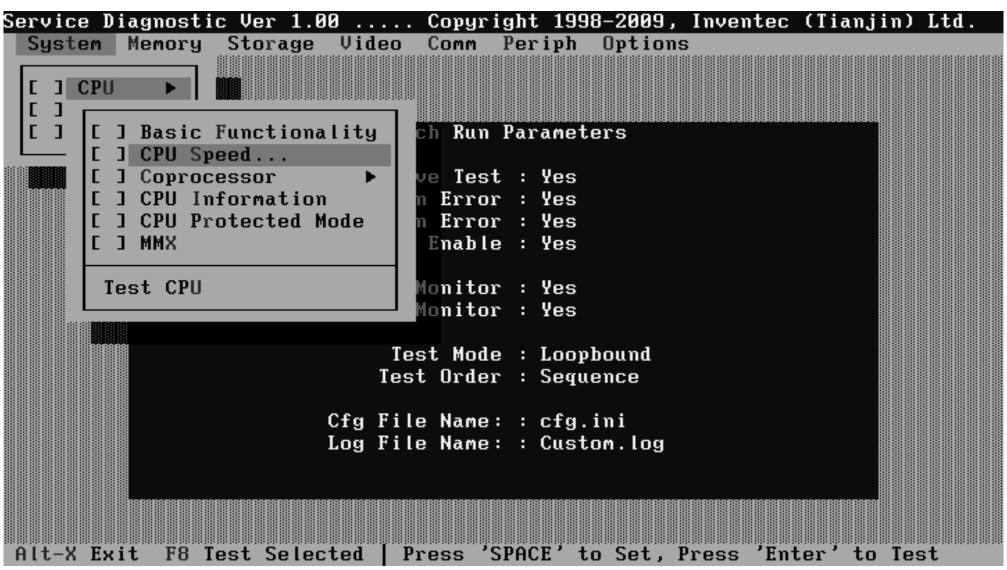


Here is another method to run the test: Highlight a test item by using arrow keys, then, press **Enter** to start. If there are parameters provided, user should set parameters in the parameter dialog window.

CPU Speed Test (Step by Step):

1. Select test item:

Select **System—CPU—CPU Speed**, then, press the **Enter** key.



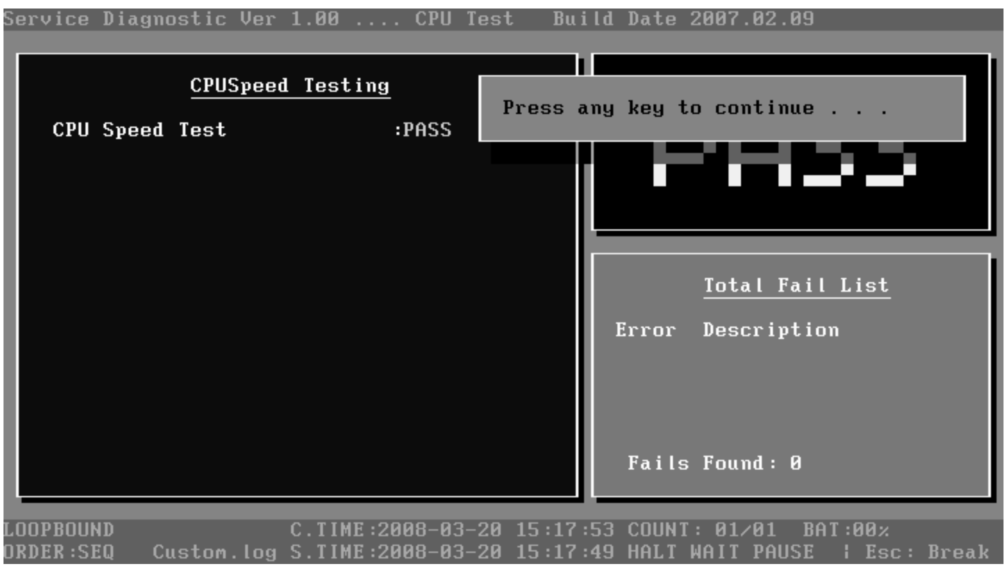
2. Parameters Setting

Choose the **OK** button after you set the proper parameters in the following window.



3. Test Result

System will automatically run and display the test result as follows:



Following is the comparison report of the two testing methods mentioned above:

1) Configuration and Running

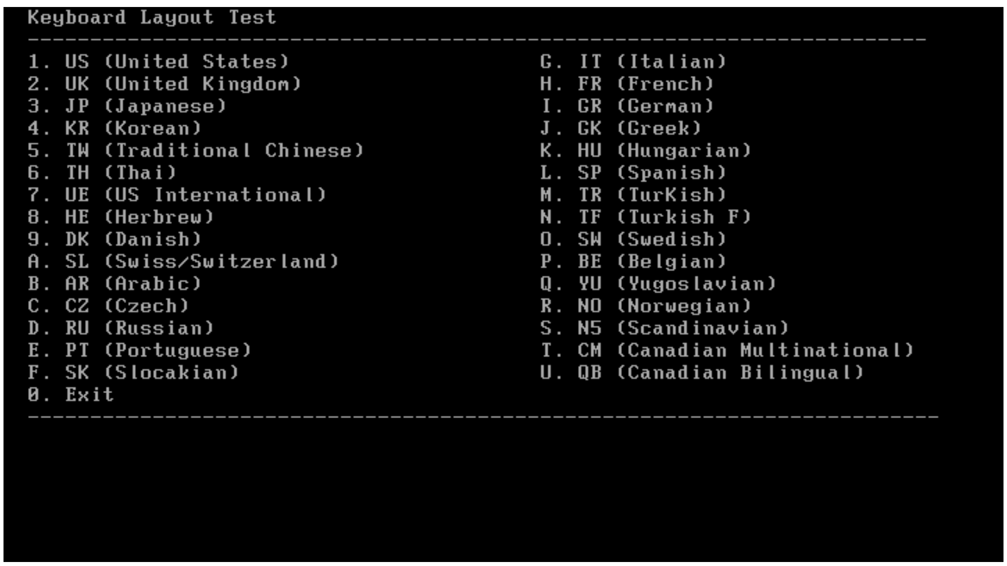
As to the method used in Mouse test, the user is required to select test items by pressing **Space** key and set the parameters artificially, (See 3.3.3 Item’s Parameters Configuration) Then press **F8** to start the test. User should configure each parameter in advance; otherwise the default parameters would be used. Using this method, user is allowed to select more than one test item at one time.

2) Running the current test item

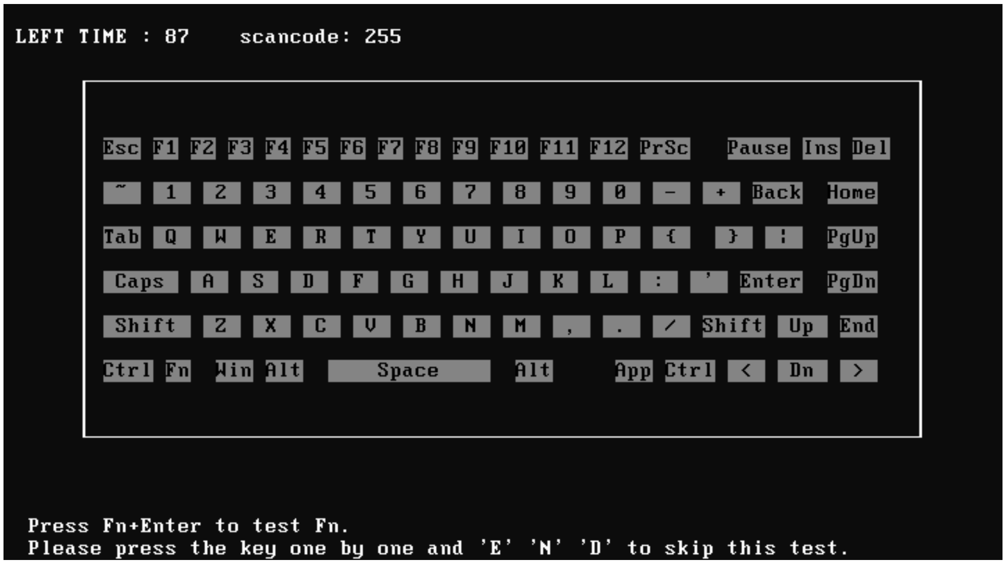
As to the method adopted in CPU Speed test, user should highlight the test item and press **Enter** to start testing. And the user has to setup the parameters every time before running the test. Using this method, only one test item would be tested at one time.

3.2.3 Keyboard Layout test

The test purpose is to check whether 30 kinds of keyboards run well during the test procedure. When users choose the item, the names of these countries will be displayed on the screen for user choice. User press any index of token in ASCII, and the program will test the kind of keymap of the country.



The test screen would be shown as below:



It requires user to press the key and check whether the key in the screen changes color or not. User can terminate test by typing '**END**'. When testing the '**Fn**' key, it must press the '**Enter**' key at the same time.

When the user has checked all the keys and all the keys in the screen have changed color, the diagnostics program would automatically end the test and report the pass information.

If keyboard test fails, program will terminate the test and report the fail information when it is time to timeout.

The test will end when all keys are pressed or test time is out after 90 seconds.

3.2.4 Hotkey Test

Check whether Hotkey run well. Hotkey test mainly functional keys, for example: IE Key Audio play etc. The methods of testing hotkey are different from keyboard tests sometimes depending on the specific type of notebooks, and this explains why some types of notebooks can be tested together with keyboard while others cannot. Press E+ +N+D to quit the test.

3.2.5 Audio Play Test

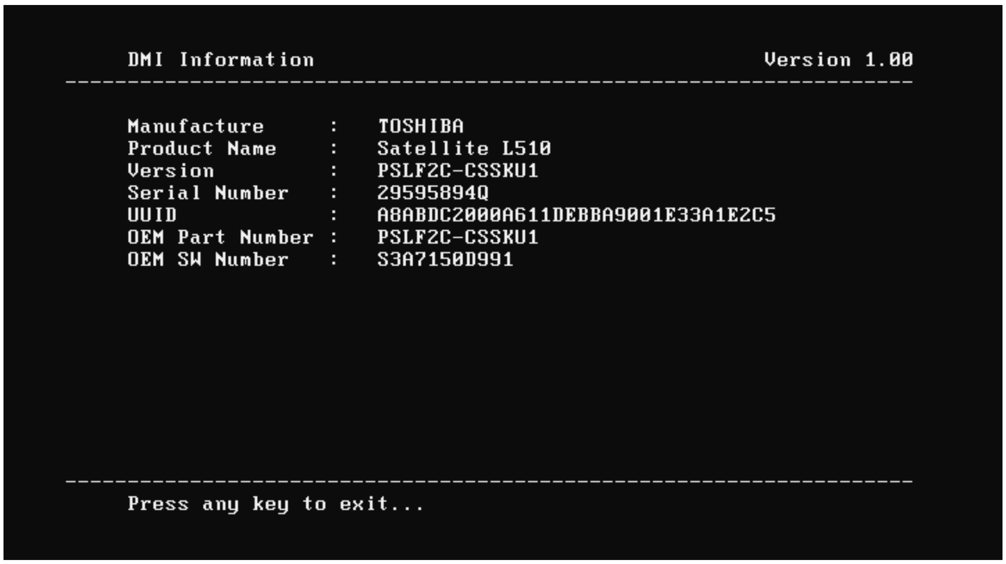
Check whether the system could playback audio normally. When the test is completed, a file named Audio_P.log will be saved in the defined location.

3.2.6 Audio Record Test

Check whether the system could record the sound normally. If there is no error during the whole test, Pass; otherwise Fail. The test will repeat for four times. When the test is completed, a file named autest.log will be saved in the defined location.

3.2.7 DMI Read

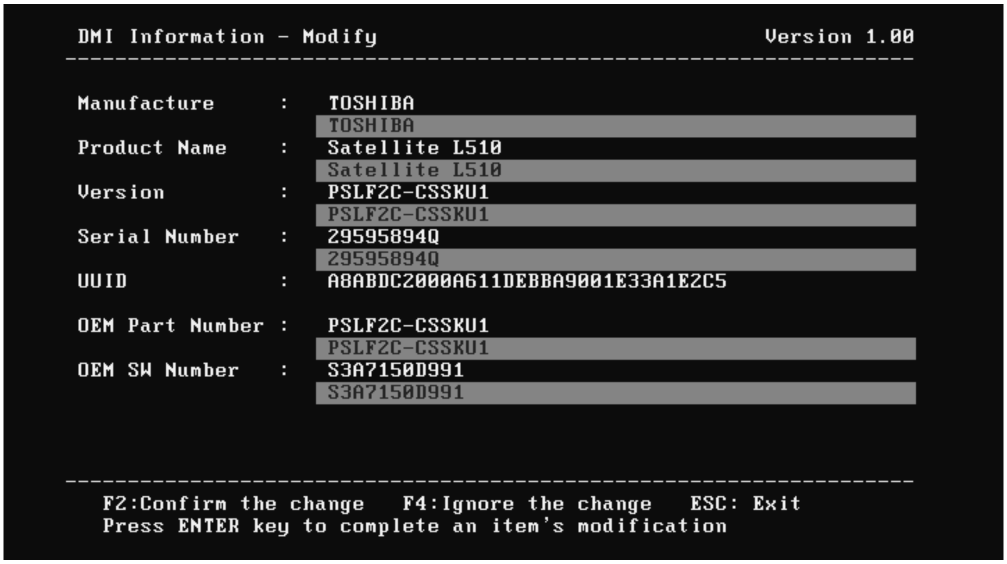
Read the information from the system's SMBIOS and display it in the screen as follows:



User can press any key to exit the program.

3.2.8 DMI Write

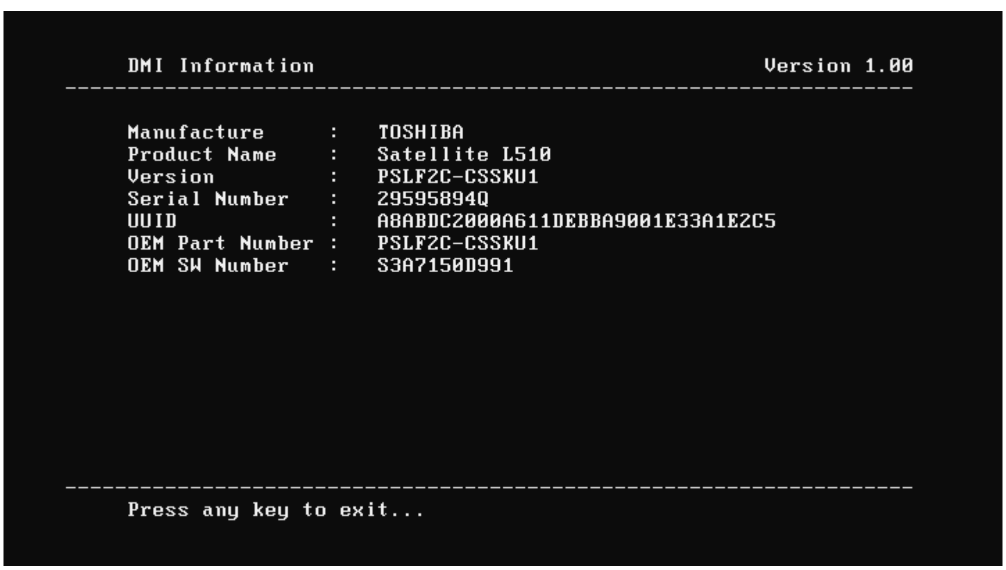
In addition to reading the DMI information, **DMI Write** also permits attributes editing and updating: Manufacture, Product Name, Version, Serial Number, and OEM Part Number, etc. The following screen will be displayed:



In this screen, there are two lines which attribute could be edited and updated. The 1st line (the font in yellow with blue background) shows the attribute's value that is read from the current system and the 2nd line (the font in red with turquoise background) shows the same value as that in the 1st line before user's editing. User can modify the attribute's value in the 2nd line and press **Enter** to confirm the current edition and continue editing the next attribute.

During the editing, user could press **F2** to confirm the DMI attribute update or press **F4** to ignore the modification. Press **ESC** to exit the program of DMI Write.

The confirmation screen is as below:



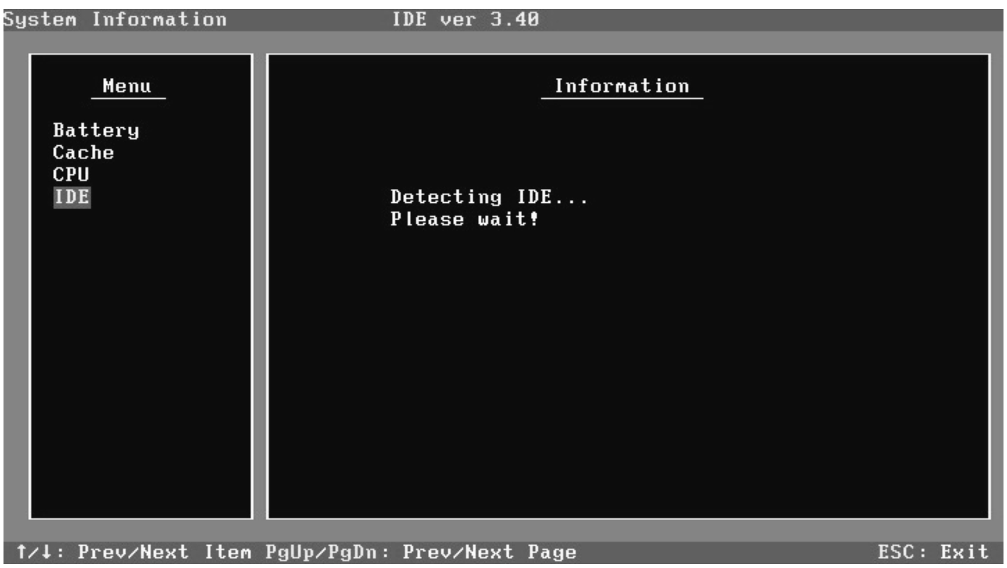
The attributes that have been modified would be marked in red; otherwise in yellow. User could press **F2** to save the changes, or press **F4** to ignore and exit the current program.

3.2.9 3D Sensor Test

NOTE: *This model doesn't support this test.*

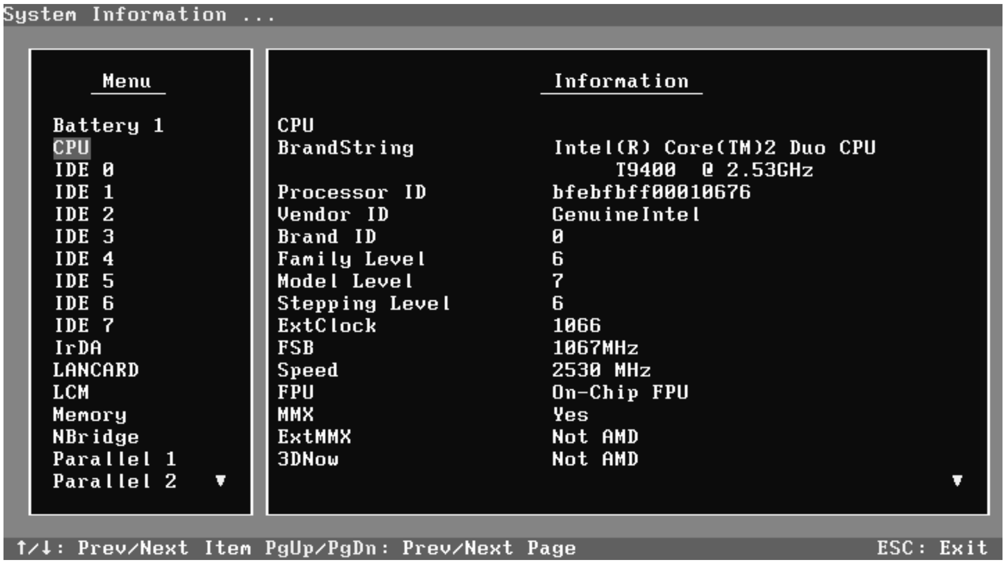
3.2.10 System Information

This function is used to read the system information. When the test is completed, a file named System.log will be saved in the defined location. During the reading process, the following screen will be displayed to indicate that the progress is in detection:



On the left column of the above screen, the detected hardware components are listed. The corresponding information of the detected hardware components is displayed on the right of the screen. It displays the current running status information of the check program. The name of the program is marked on the top of the screen. At the bottom, the function keys are listed for user operation. During the detection, keyboard operation is invalid.

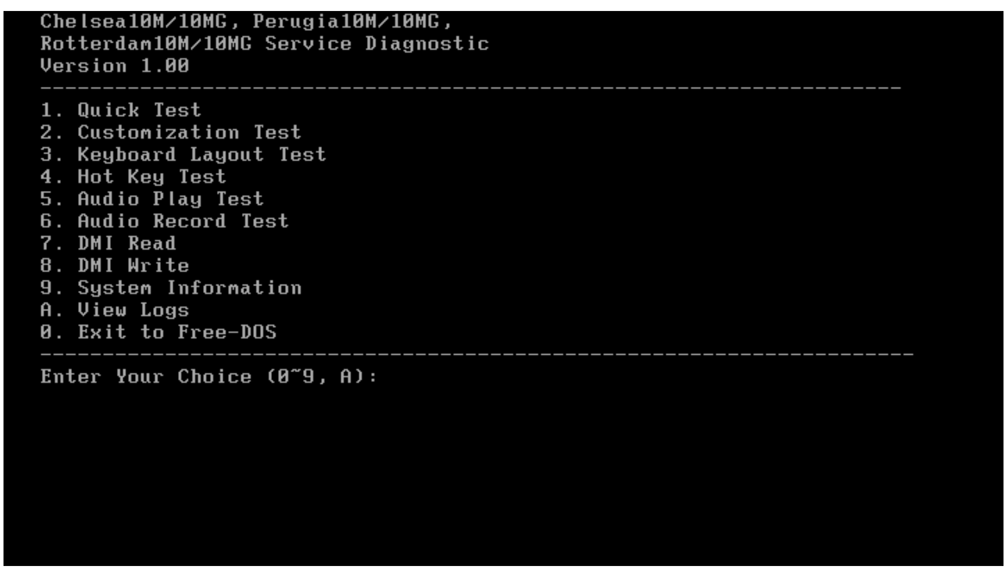
When the detection is finished, the hardware components information will be displayed as follows:



User can use function keys listed on the bottom of the screen to display the configuration of the component or exit the current program. On the left column, the components information is listed and user can use arrow keys or **PgUp/PgDn** to view the list and highlight the chosen component. On the right column, the configuration information of the highlighted component is listed. Press **ESC** to exit this program.

3.2.11 View Logs

User can enter one choice to view a log file in the screen as follows.

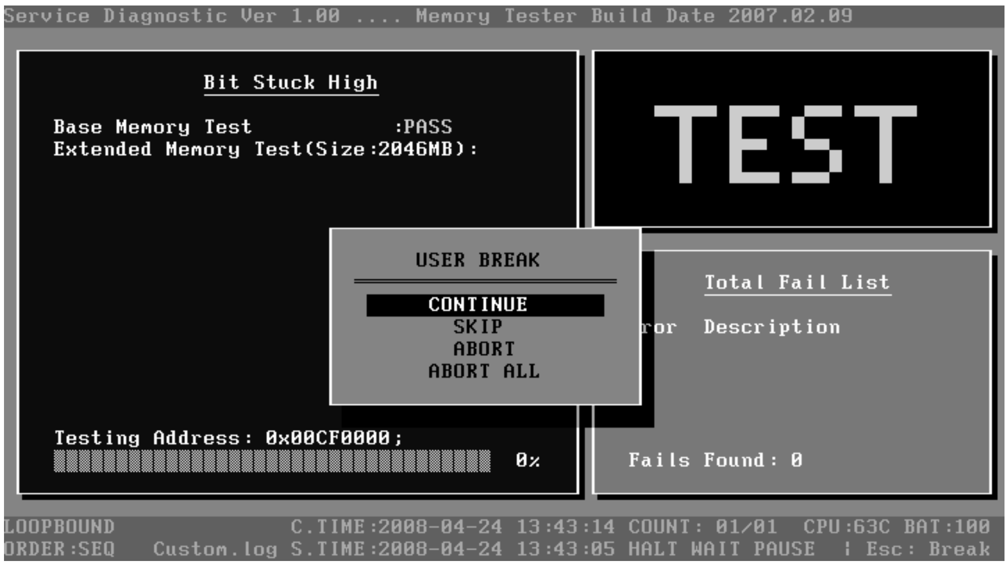


3.2.12 Exit to Free DOS

Select this item to exit to Free DOS.

3.2.13 The Diagnostics Screen Explanation

Below is an example of running a test item. It includes the following parts: Diagnostics Windows, Test Status Area, Progress Bar, Error List, Test Item's Title, Status Bar and Message Box.



1. Diagnostics Windows

When a test item is running, a Diagnostics Windows is displayed in full screen. It consists of the following parts: Title Bar, Test Running Status and Report Panel, Status Bar. There would prompt a message box called USER BREAK in the central of the window whether user press **ESC** to interrupt the test.

2. Test Running Status and Report Panel

Test Running Status and Report Panel are located on the middle of Diagnostics Windows.

◆ Test item name, test process and test result are displayed in the left;

◆ Test status and result are displayed in the upper right corner of the screen. It displays the test status of the current test item – TEST (in testing), PASS (test finished and its result is passed), FAIL (test finished and its result is failed) and SKIP (test skipped).

◆ The error list of each test module is displayed at the lower right corner of the screen. It would display the total error quantity found in the test, the most recent five error codes and description would be shown here. Detailed error report could be viewed with Logview.exe.

◆ When pressing **ESC** key during the test process, a User Break Windows will be popped up for the user to select.

3. USER BREAK

Pressing **ESC** key to interrupt the test, USER BREAK message box would be prompted out in the central of Diagnostics Window for the user to select the following actions:

◆ **CONTINUE**---- Continue the test;

◆ **SKIP**---- Stop the sub-item of current test item to go to the next item's test;

◆ **ABORT**----Stop the current test item to test the next module.

◆ **ABORT ALL**---- Stop all the selected test items. User could use the hot key **Ctrl+D** to achieve the same operation. When the user calls ABORT ALL, the following message box will prompt for his selecting.



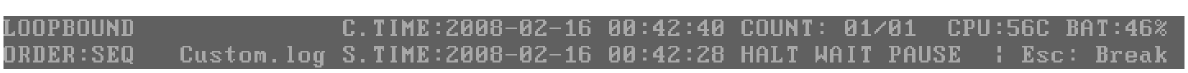
4. Title Bar:

Title Bar located at the top of the window, it includes information as follows:

◆ **Program Name and Its Version:** Service Diagnostic Ver1.10;

◆ **Test Module Name:** Label the name and version of the test module. For example, in the above screen, the name of the test module is 'Memory Tester Build Date 2007.02. 09'.

◆ **Status Bar:** Located at the bottom of the screen as follows:



The status bar is used to indicate the current script setting and test status. It consists of two lines that includes the information as follows:

◆ **Test Mode**: TIMEBOUND or LOOPBOUND, e.g. LOOPBOUND in the above screen;

◆ **Script File Name**: Script file name, e.g. 'Custom.INI' in the above screen;

- **Current Time(C. TIME)**: Current system time, e.g. 'C.TIME:2008-02-16 00:42:40' in the above screen;
- **Test Time Remaining (LEFT)**: In TIMEBOUND mode, it would display the remaining test time at the same location as Current TIME (C. TIME) in the above screen;
- **Current Loop Count**: In LOOPBOUND mode, it will display the total LOOP number planning to execute and the current LOOP number have been finished, e.g. 'COUNT: 01/01' in the above screen;
- **CPU Temperature**: Detect the temperature in the current CPU, e.g. 'CPU: 56C' in the above screen;
- **Remaining Battery Capacity**: Remaining Battery Capacity detected in the current Battery, e.g. 'BAT: 46%';
- **Test Order**: Define the test sequence. There is two sequence modes: Sequential Test Mode and Random Test Mode. The default mode is Sequential Test Mode, it would displays 'ORDER: SEQ' as in the above screen;
- **LOG File Name**: Display the file name of the test log, e.g. Custom.Log in the above screen;
- **Start Test Time** (S.TIME): Display the test start time for the current test item or the test script, e.g. 'S.TIME: 2008-02-16 00:42:28' in the above screen;
- **Break On Error**: Display 'HALT' as shown in the above screen when 'Break On Error' is enabled;
- **Wait On Error**: Display 'WAIT' as shown in the above screen when 'Wait On Error' is enabled;
- **Pause Enable**: Display 'PAUSE' when "Pause Enable" is enabled;
- **Manual Interrupt Method**: Display 'Esc: Break' to tell the user how to manually interrupt the test process.

3.3 Options

3.3.1 Overview

In Service Diagnostics, with the **Options** menu user can configure the batch parameters, test item's parameters and those parameters created by the LOG file.



Options Menu Notes:

- Select All/None Items

Switch between selecting all test items and selecting none. The hot key is **F6**.

- Test Selected Items

Execute all selected test items in this editor. The hot key is **F8**.

If "Interactive" option in batch parameters has not been selected, a warning message would be shown as below:



- Edit Batch Parameters

Configure batch parameters and all the test item's parameters.

- Load Batch Parameters

Upload all the test items and the parameters to the *.ini file.

- Save Batch Parameters

Save all the parameters and the test items that are configured in the editor to a specified file.

- Log Parameters

Configure LOG parameters.

- Specify LOG Viewer

Specify the viewer for the LOG file.

- Display Error Log File

Load the LOG file viewer specified in the Specify Log Viewer to view the LOG file.

- DOS Shell

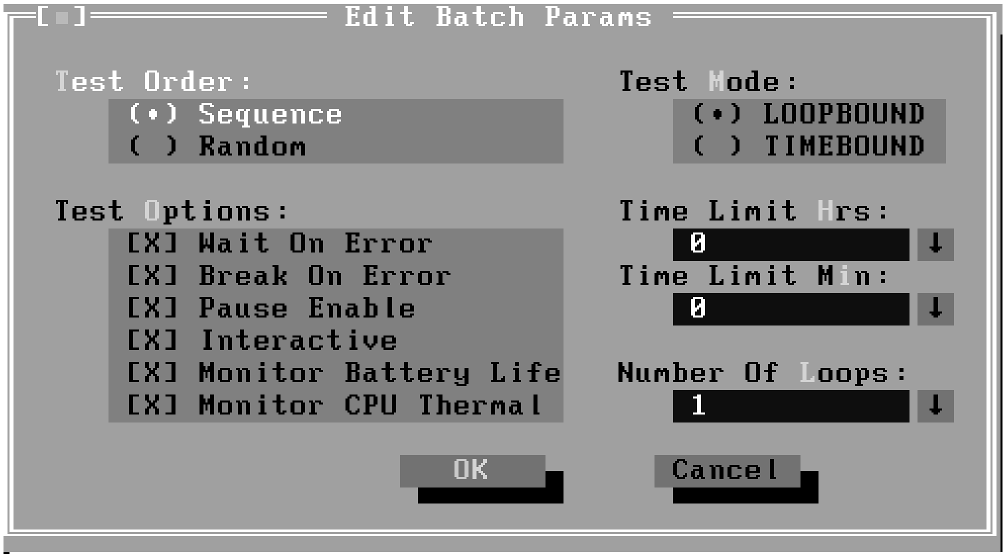
Enter the DOS Shell and execute the DOS programs. You can also exit to the Service Diagnostics Editor by the command of **EXIT**.

- Exit to DOS

Exit the Service Diagnostics Editor and back to DOS.

3.3.2 Batch Parameters Configuration

The batch parameters configuration screen can be accessed through Service Diagnostics/OPTIONS -> EDIT BATCH PARAMETERS -> BATCH PARAMETERS:



- **Test Order**

Specify the order of the test items. Choose 'Sequence' to adopt the sequential mode; choose 'Random' to run the test items in random sequence.

- **Test Options**

Choose one of the following options:

✓ **Wait On Error**

Wait for further confirmation while an error occurs.

✓ **Break On Error**

Stop the test when a test item fails.

✓ **Pause Enable**

Pause at the end of each test items and wait for the user to response with the test items that requires the user to assist the test processes, such as the keystroke test.

✓ **Interactive**

If the item is enabled during the test, the test items that need user to response can run normally, such as Mouse test; If it is disabled, those test items will report FAIL.

When the option here is enabled, it would affect all the test items while the same option in “Item Parameters Configuration” only affect that test item.

✓ **Monitor Battery Life**

Monitor the remaining battery capacity (percent).

✓ **Monitor CPU Thermal**

Monitor the CPU temperature.

- **Test Mode**

✓ **LOOPBOUND**

The chosen test items will run repeatedly according to the times specified in the 'Number of Loops'.

✓ **TIMEBOUND**

The chosen test items will run for an extent time specified in 'Time Limit Hrs' and 'Time Limit Min'.

- **Time Limit Hrs**

Specify the hours whether 'TIMEBOUND' is chosen under the batch mode.

- **Time Limit Min**

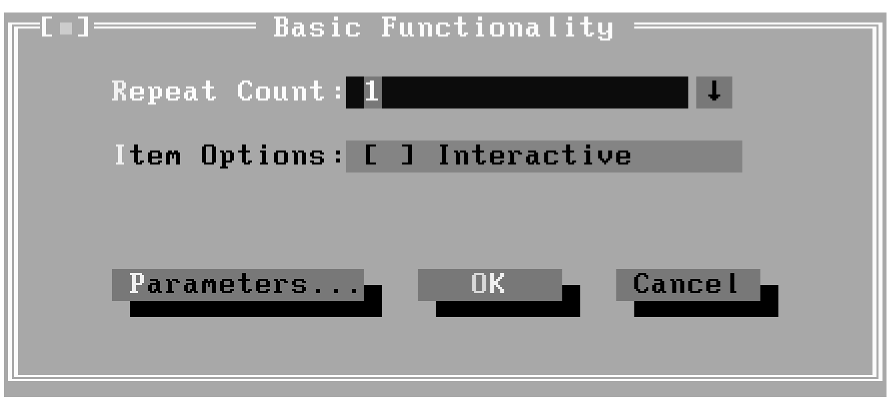
Specify the minutes whether 'TIMEBOUND' is chosen under the batch mode.

- **Number Of Loops**

Specify the repeating times when 'Loop Bound' is chosen under the batch mode.

3.3.3 Item's Parameters Configuration

The test items' parameters configuration screen can be accessed through Service Diagnostics/Options -> Edit Batch Parameters -> Item's Parameters-> System->CPU-> Basic Functionality:



- **Repeat count**

Repeat times of the test item.

- **Interactive**

  If the item is enabled during the test, the test items that need user to response can run normally, such as PS2 Mouse test; If it is disabled, those test items will report FAIL.

  Whether the option here is enabled, it only affects the current test item.

- **Parameters**

  For the test items with specific parameters, this option will call the related configuration screens. Otherwise, the program will show the following dialogue window:

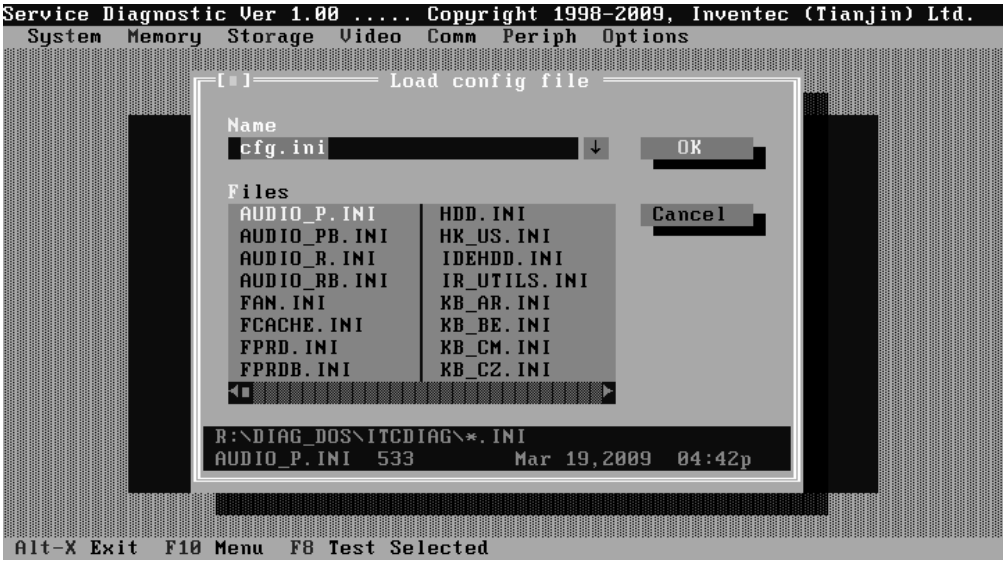


Parameters for the specific test items:

Some test items (Memory, HDD, e g...) have their individual parameters, which can be configured in their parameters setting window.

3.3.4 Load Batch Parameters

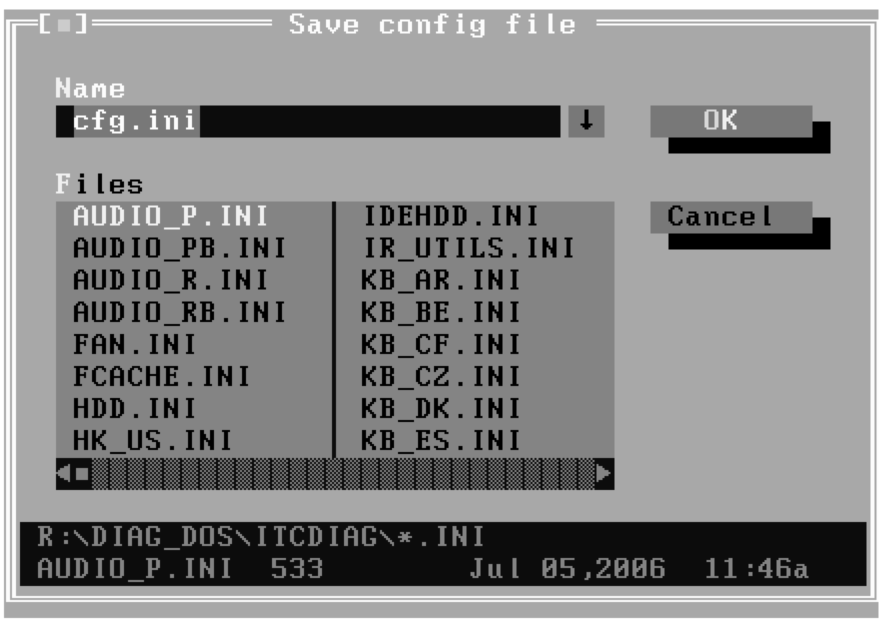
Batch parameter is saved in the script file whose extension name is INI (*.INI). Below is the screen shot of "Load Batch Parameters".



In this window, you can specify the .INI files that you wanted to be edited or modified.

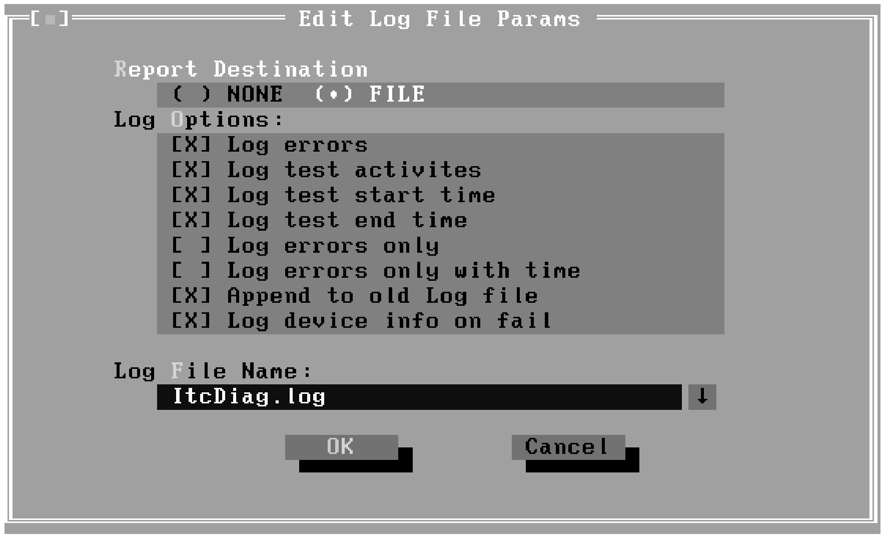
3.3.5 Save Batch Parameters

Here you can save the edited or modified content to the batch parameters files.



3.3.6 LOG Parameters Setting

You can access the Log Parameters screen through Service Diagnostics\Options - Generate Report.



- **Report Destination**

  If selecting 'NONE', no log file will be generated; if selecting 'FILE', a log file with the name specified in 'Log File Name' will be generated.

- **Log Options**

✓ **Log Errors**

If selecting this parameter, errors will be recorded when the test fails.

✓ **Log Test Activities**

If selecting this parameter, the subtest results will be recorded.

✓ **Log Test Start Time**

If selecting this parameter, the start time of the test will be recorded.

✓ **Log Test End Time**

If selecting this parameter, the end time of the test will be recorded.

✓ **Log Errors Only**

If selecting this parameter, errors will be recorded only when the test fails.

✓ **Log Errors Only with Time**

If selecting this parameter, errors and time will be recorded only when the test fails.

✓ **Append to Old Log File**

If selecting this parameter, the new log will be added to the old one.

✓ **Log Device Info on Fail**

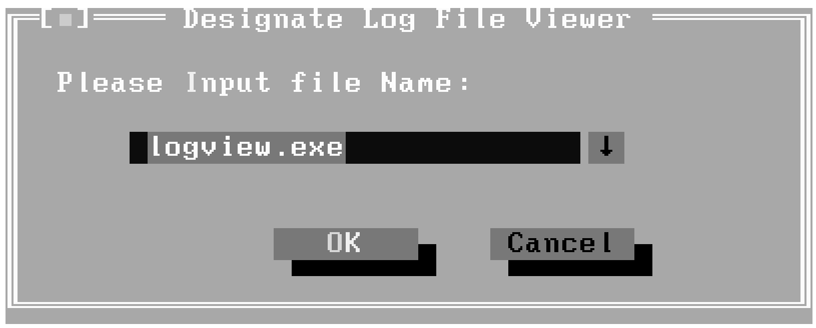
If selecting this parameter, details of the failed test will be recorded.

- **Log file Name**

  Specify the Log file name. You can input the detail path of the file. System will show the detail path of the file.

3.3.7 Specify LOG Viewer

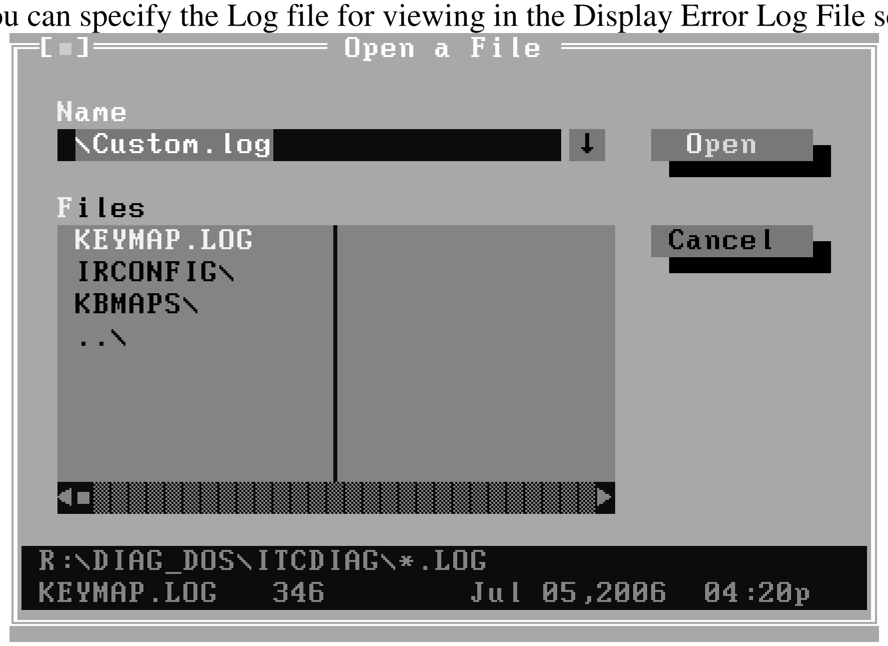
You can specify the Log file viewer in the Specify Log Viewer screen.



The default viewing program of Service Diagnostics is **LogView.exe.**

3.3.8 Display LOG File

You can specify the Log file for viewing in the Display Error Log File screen.



In this screen, you can specify a Log file and view it with the viewer designated in Specify LOG Viewer.

3.3.9 LOG Viewer

Service Diagnostic Log viewer:



- ↑, ↓

  Scroll a line backward or forward on the screen.

- **Page Up, Page Down**

  Scroll a page backward or forward on the screen.

- **Esc**

  Exit the Log viewer.

- **F1**

  Display the Help information about the Log viewer operations and the functional keys.

- **Ctrl+Home**

  Go to the start of the log file.

- **Ctrl+End**

  Go to the end of the log file.

- **Ctrl+F3**

Prompt the search dialogue for the user to input the string to be looked for and specify the searching method.

- **F3**

Find the next corresponding strings given.

3.3.10 LOG File Sample

Log file is a test result file, which records the following information: Test module name, Test item name, Start/End time and the test result (including PASS, FAIL, SKIP and ABORT). When a failure is found, both the error code and the error information were recorded.

In the Log file, we use **Test Items** as the test item name, which could not be modified in the whole time. And we use the **Internal Name** as name in the program's UI, which corresponds to the test item name and could be modified according to the user's favorite.

The following section is a sample of log file:

DIAG REPORT

<Module Name>: Service Diagnostic Ver 1.00 ... Memory Tester Build Date 2006.01.10

[Walk High]

Begin Time: Wed Jul 05 10:45:36 2006

Base Memory Test : PASS

Extended Memory Test : PASS

End Time: Wed Jul 05 10:47:51 2006

<Module Name>: Service Diagnostic Ver 1.00 ... Mouse Test Build Date 2006.01.10

[MSTPad]

Begin Time: Wed Jul 05 10:48:54 2006

Touch Pad Test : FAIL

ITEM TEST FAIL

Function ID :502

Error Code :50202

Error Message :Touch Pad Test Fail

End Time: Wed Jul 05 10:49:16 2006

3.4 Subtests

Test Group	Sub Item ID	Subtest	Test ID	Test items	Internal Name
System	01	CPU	01	Basic Functionality Test	[CPUBasicFun]
			02	CPU Speed	[CPUSpeed]
			03	Coprocessor NPU Basic Functions NPU Interrupt	Coprocessor [NPUFun] [NPUInterrupt]
			04	CPU Information	[CPUInformation]
			05	CPU Protected Mode	[Protect]
			06	MMX	[MMX]
	02	Board	01	DMA Controller	[DMACtrl]
			02	Interval Timer	[Timer]
			03	Clock / Calendar	[RealClock]
			04	PCI System	[PCI]
			05	Plug and Play	[PnP]
			06	ACPI Test	[ACPI]
	03	FAN	01	CPU Fan Speed Test	[FANSpeed]
Memory	01	BIOS ROM			[BIOSROM]
	02	Parity			[Parity]
	03	Pattern	01	Bit Stuck High Test	[BSHigh]
			02	Bit Stuck Low Test	[BSLow]
			03	Checker Board Test	[ChkBd]
			04	CAS Line Test	[CASLine]
			05	Incremental Test	[Incrment]
			06	Decremental Test	[Decrment]
			07	Incremental Decremental Test	[Idcrment]
	04	Extended Pattern	01	Write/Read Cycle Test	[XWRCycle]
			02	Read Cycle Test	[XRCycle]
	05	Walking 1's Test			[WalkHigh]
	06	Walking 0's Test			[WalkLow]
	07	Memory Address			[Address]
	08	Refresh Test			[Refresh]
	09	Cache Memory			[CacheOne]
	10	Random Memory	01	Randomize Test	[Random]

			02	Random Increment Read/Write	[RandIncr]
	11	Data Bus Test			[DataBus]
	12	Memory Speed Test			[MemSpeed]
Storage	01	HDD	01	Sequential/Random R/W	[SeqRdRW1]
			02	Sequential/Random Seek	[Seek1]
			03	Performance	[Perform1]
			04	Controller Check	[Controller1]
			05	Diagnostic Read/Write	[DiagRW1]
			06	SMART Test	[SMART1]
	02	ODD	01	Controller Test	[CDRWController]
			02	Data Transfer Rate	[CDRWTransRate]
			03	Data CD Butterfly Seek	[CDRWButterfly]
			04	Data CD Random Seek	[CDRWSeek]
			05	Data CD Sequence Seek	[CDRWSFSeek]
			06	Tray Eject Test	[CDRWTray]
Video	01	Text Mode	01	Character Test	[CharTest]
			02	Text Attribute	[Attribut]
			03	Text Page Selection	[PageSel]
			04	Text Color	[Color]
			05	80*25 Text Mode	[Text Mode]
	02	640*480 VGA Mode			[VGAMode]
	03	VESA Video Modes	01	640X480 Video Modes VESA 640x480x256 Mode VESA 640x480x32K Mode VESA 640x480x64K Mode VESA 640x480x16K Mode VESA 640x480x32bit Mode	[V640480_15] [V640480_16] [V640480_24] [V640480_32]
			02	800X600 Video Modes VESA 800x600x256 Mode VESA 800x600x64K Mode VESA 800x600x32K Mode VESA 800x600x16K Mode VESA 800x600x32bit Mode	[V800600_15] [V800600_16] [V800600_24] [V800600_32]
			03	1024X768 Video Modes VESA 1024x768x256 Mode VESA 1024x768x64K Mode VESA 1024x768x32K Mode VESA 1024x768x16K Mode VESA 1024x768x32bit Mode	[V1024768_15] [V1024768_16] [V1024768_24] [V1024768_32]

			04	1280X800 Video Modes VESA 1280x800x256 Mode VESA 1280x800x64K Mode VESA 1280x800x32K Mode VESA 1280x800x16K Mode VESA 1280x800x32bit Mode	[V1280800_15] [V1280800_16] [V1280800_24] [V1280800_32]
	04	VESA Video Memory			[VESAMEM]
	05	AGP Test			[AGP]
	06	LCD Panel Test			[LCDPanel]
	07	Register Test			[Register]
	08	Color Purity Test			[ColPurity]
	09	Direct Color Test			[DirectColor]
	10	DAC/Palette Address			[DACPalAddr]
	11	Bitblt Engine Test			[Bitblt]
COMM	01	LAN Card	01	Device ID Detection	[DeviceID]
			02	Vendor ID Detection	[VendorID]
			03	Mac Address Detection	[MAC Address]
	02	1394	01	GUID Detection	[1394 R/W Test]
Peripheral	01	Keyboard	01	Keyboard Data Line	[KBDataLn]
			02	Keyboard Clock Line	[KBClokLn]
	02	Mouse	01	TouchPad	[MSTpad]
	03	Led	01	Device Led	[KBLED]

3.5 System Test

Move arrow keys and press the **Space** key to select CPU test item from Service Diagnostic menu, then highlight **CPU** and press the **Enter** to run this test item.

Subtest 01 CPU

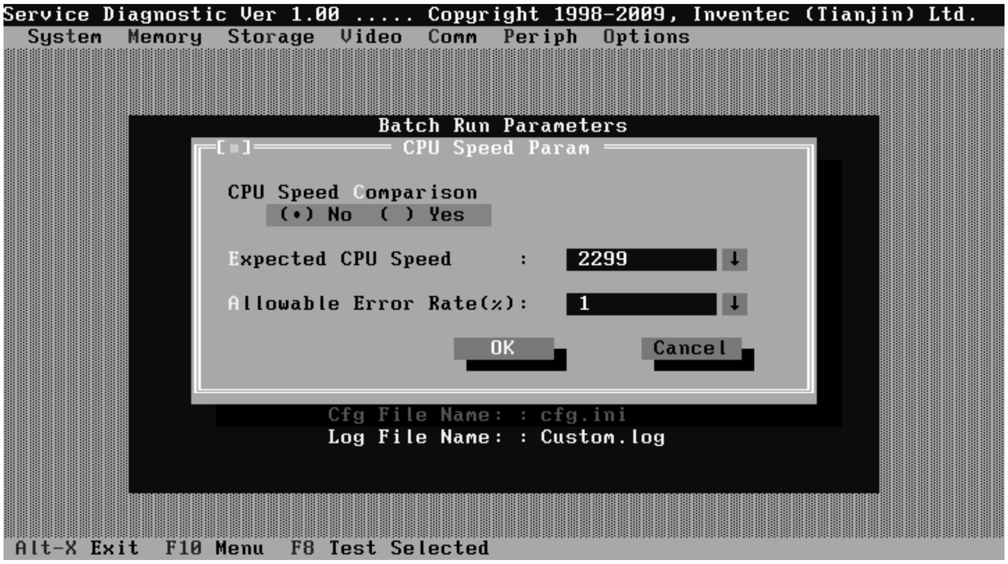


1. Basic Functionality Test

   This test item is to check whether the CPU works normally through math and logic calculation, which means verifying the general registers, math registers and logic registers.

2. CPU Speed

   This test item is to detect the work frequency of the current CPU. User should change the parameters setting in the following window before the test:



CPU Speed Comparison--Whether you want to make a comparison of the CPU speed with the value set in 'Expected CPU Speed', you should choose 'Yes'; otherwise, 'No'.

Expected CPU Speed--Specify the expected CPU Speed value you want for further comparison.

Allowable Error Rate-- Specify the Allowable Error Rate value you want for further comparison.

3. Coprocessor

✓ **NPU Basic Functions Test**

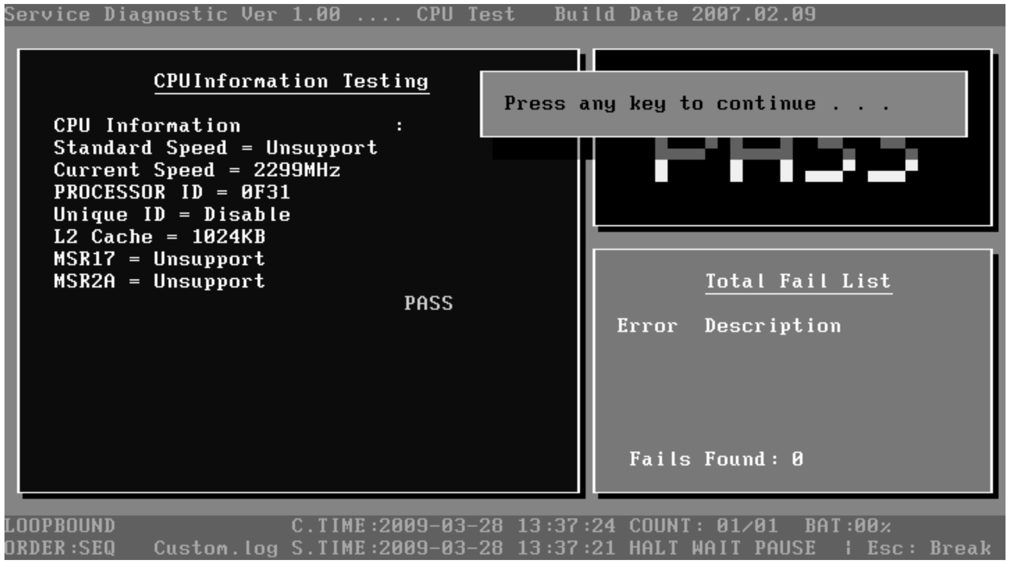
This test item is to check whether the precision of the numeric processor in the float calculation is up to the IEEE standards.

✓ **NPU Interrupt Test**

This test item is to check whether NPU transfers the abnormal Interrupt program correctly by forcing an abnormal float.

4. CPU Information

This test item is used for getting & showing CPU Information. It will be displayed as follows:



5. CPU Protected Mode Test

   This test item is to check whether CPU protected mode instruction works normally.

6. MMX

   The test item is to confirm whether the CPU supports MMX instructions.

Subtest 02 Boards

1. DMA Controller

   This test item is to check whether the DMA controller works normally.

2. Interval Timer

   This test item is to check whether the Interval Timer (18.2Hz, 55ms) works normally.

3. Clock/Calendar

   This test item is to check whether the system clock/calendar works normally.

4. PCI System

   This test item is to check whether the bus number, device number and function number in PCI bus are valid.

5. Plug and Play

This test item is to check:
1. Whether the current system supports Plug-n-Play;
2. Whether there is an ESCD (Extended System Configuration Data) in the BIOS;
3. Whether there is PCI-to-ISA bridge in the system;
4. Whether there is PCI bus in the system.

6. ACPI Test

ACPI test includes two sub-items as below:
System Address Map Test: Check the correctness of ACPI system memory map, and whether its mapping scope is within real memory.
ACPI Table Test: Check the correctness of ACPI relative configuration tables in the current system.

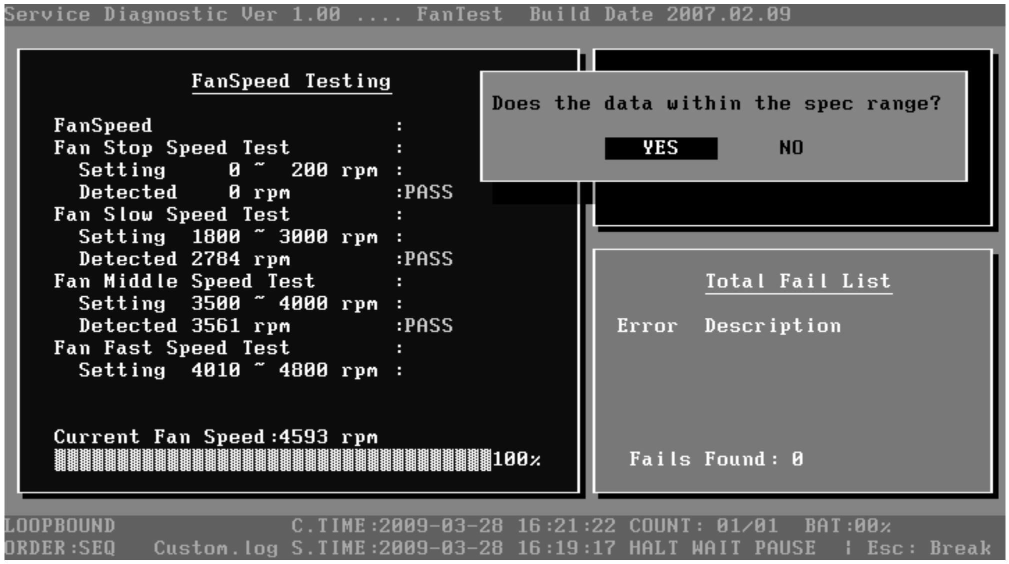
Subtest 03 FAN Speed Test

1. CPU Fan Speed Test

This test item is to check whether the CPU fan currently used works normally in the different speeds of stop, slow, middle and fast.



It will be displayed as follows:


Service Diagnostic Ver 1.00 .... FanTest Build Date 2007.02.09
FanSpeed Testing
FanSpeed :
Fan Stop Speed Test :
Setting 0 ~ 200 rpm :
Detected 0 rpm :PASS
Fan Slow Speed Test :
Setting 1800 ~ 3000 rpm :
Detected 2784 rpm :PASS
Fan Middle Speed Test :
Setting 3500 ~ 4000 rpm :
Detected 3561 rpm :PASS
Fan Fast Speed Test :
Setting 4010 ~ 4800 rpm :
Current Fan Speed:4593 rpm
100%
Does the data within the spec range?
YES
NO
Total Fail List
Error Description
Fails Found: 0
LOOPBOUND C.TIME:2009-03-28 16:21:22 COUNT: 01/01 BAT:00%
ORDER:SEQ Custom.log S.TIME:2009-03-28 16:19:17 HALT WAIT PAUSE | Esc: Break

3.6 Memory Test

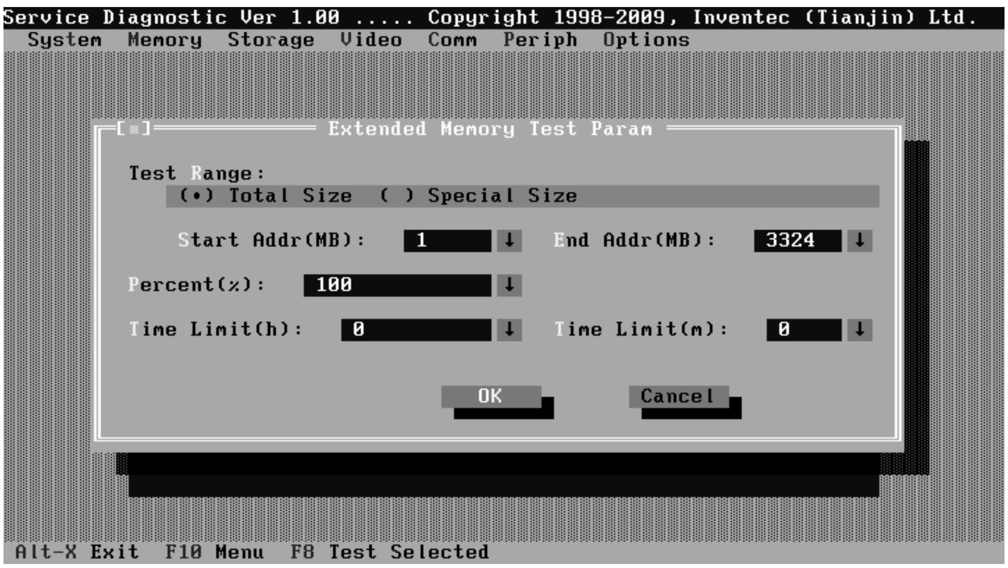
This test module is to check whether the memory chip works normally.

Subtest 01 BIOS ROM

This test item is to check the validity of BIOS ROM that includes two sub-items -- ROM Read and ROM Write Protection. ROM Read is to check whether BIOS ROM could be correctly read out, ROM Write Protect is to check whether BIOS ROM is write-protected.

Subtest 02 Parity

This test item is to check whether the parity checkout error could happen through writing and reading memory. Below is the parameter setting dialog window.



Test Option: Choose the Memory part to take the test– Base Memory or Extended Memory.

Extended Memory Test Range: Specify the test coverage range of Extended Memory. If user chooses Total Size, it means that the whole Extended Memory will be tested. Although user can input the parameter into other select box, but the selected result is invalid. If user chooses Special Size, the test of Extended Memory will be taken according to the coverage range that user chooses or time.

Extended Memory Start Address (MB) & Extended Memory End Address (MB): Set the range of extended memory that is to be tested, the test coverage would be based on the setting and the value in 'Percent (%) mentioned at below.

Pattern Size: Choose the pattern size – BYTE, WORD, DWORD or ALL.

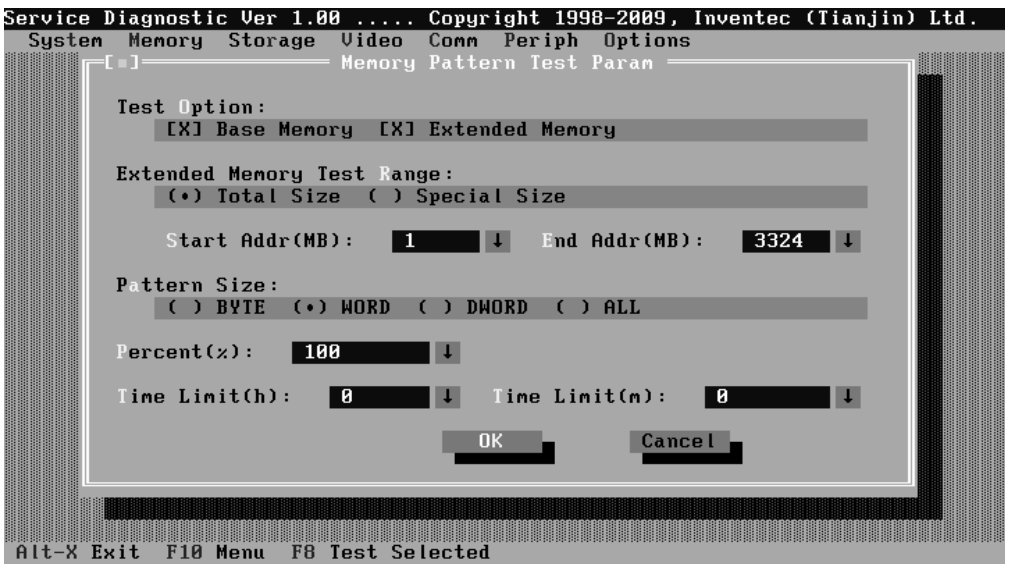
Percent (%): Choose the percentage of the defined range of the memory to be tested.

Time Limit(h): Choose or Input the time (hour) of the defined range of the memory to be tested.

Time Limit(m): Choose or Input the time (minute) of the defined range of the memory to be tested.

Subtest 03 Patterns

This test item is to check whether the system memory includes base memory and extended memory that could be accessed correctly through writing and reading with a series of designed pattern data. Below is the parameter setting dialog window.



Test Option: Choose the Memory part to take the test– Base Memory or Extended Memory.

Extended Memory Test Range: Specify the test coverage range of Extended Memory. If user chooses Total Size, it means that the whole Extended Memory will be tested. Although user can input the parameter into other select box, but the selected result is invalid. If user chooses Special Size, the test of Extended Memory will be taken according to the coverage range that user chooses or time.

Extended Memory Start Address (MB) & Extended Memory End Address (MB): Set the range of extended memory that is to be tested, the

test coverage would be based on the setting and the value in ‘Percent (%) mentioned at below.

Pattern Size: Choose the pattern size – BYTE, WORD, DWORD or ALL.

Percent (%): Choose the percentage of the defined range of the memory to be tested.

Time Limit(h): Choose or Input the time (hour) of the defined range of the memory to be tested.

Time Limit(m): Choose or Input the time (minute) of the defined range of the memory to be tested.

1. Bit Stuck High Test

   Data pattern: Every bit is ‘1’ (Each bit is high)

2. Bit Stuck Low Test

   Data pattern: Every bit is ‘0'(Each bit is low);

3. Checker Board Test

   Data pattern: Lo-byte and hi-byte are composed with 0101(0x5) and 1010 (0xA);

4. CAS Line Test

   Data pattern: Lo-byte and hi-byte are composed with 0000 (0x0) and 1111(0xF);

5. Incremental Test

   Data pattern: A series of increasing data from 0 by adding 1 each time;

6. Decrement Test

   Data Pattern: A series of decreasing data from the maximum (e.g. 0xFFFF) by subtracting 1 each time;

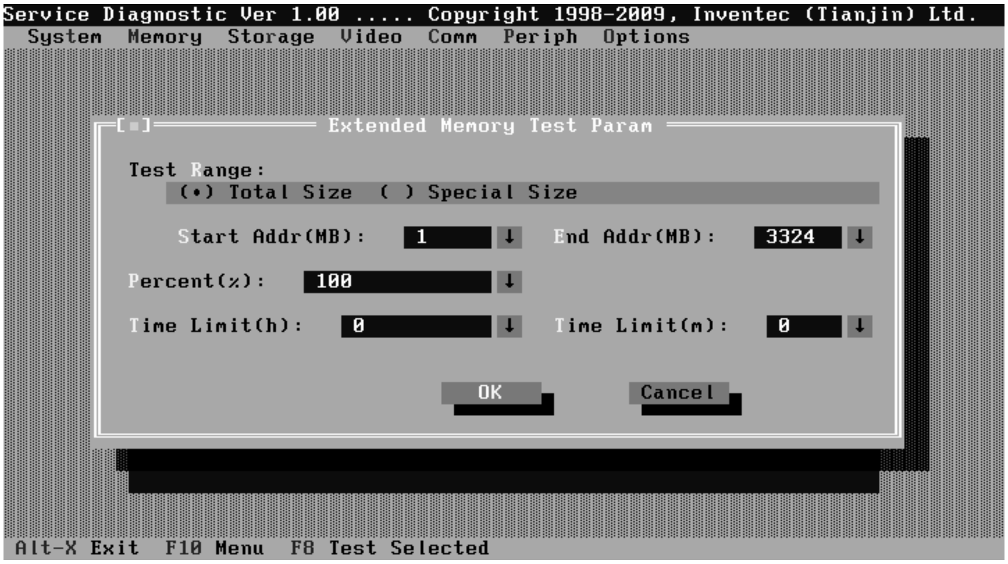
7. Incremental / Decrement Test

   Data Pattern is a series of data whose low byte is increasing data from 0x00 and high byte is decreasing data from 0xFF.

Subtest 04 Extended Pattern

In addition to the above pattern test of the memory, there is Read/Write Cycle test and Read Cycle Test for the extended memory.

Below is the parameter dialog window of the extended pattern test.



Test Range: Specify the test coverage range of Extended Memory. If user chooses Total Size, it means that the whole Extended Memory will be tested. Although user can input the parameter into other select box, but the selected result is invalid. If user chooses Special Size, the test of Extended Memory will be taken according to the coverage range that user chooses or time.

Extended Memory Start Address and Extended Memory End Address (MB): Set the range of extended memory that is to be tested. The test coverage will be according to the value setting in 'Percent (%)' mentioned at below.

Percent (%): Choose the percentage of the defined range of the memory to be tested.

Time Limit(h): Choose or Input the time (hour) of the defined range of the memory to be tested;

Time Limit(m): Choose or Input the time (minute) of the defined range of the memory to be tested.

1. Write/Read Cycle Test

Test by using both read and write instructions.

2. Read Cycle Test

Test by using read instructions.

Subtest 05 Walking 1's Test

The test item is to ensure that there is no short circuitry issue in memory chip. The parameter dialog window is the same as that in 'Subtest 02 Pattern'.

Subtest 06 Walking 0's Test

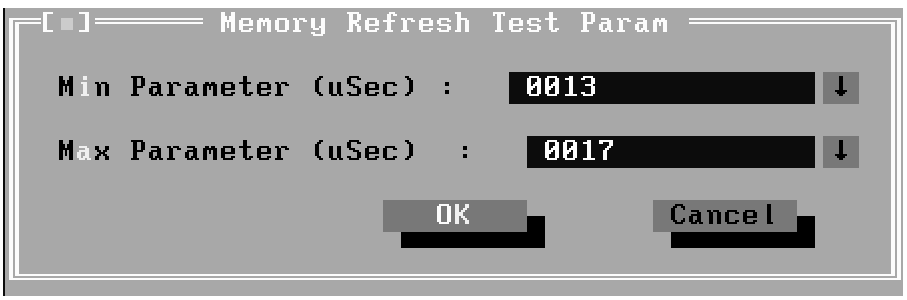
The test item is to ensure that there is no open circuitry issue in memory chip. The parameter dialog window is the same as that in 'Subtest 02 Pattern'.

Subtest 07 Memory Address

This test item is to check short and open issue on memory address lines**.**

Subtest 08 Refresh Test

This test item is to check whether the memory refresh works normally. The parameter dialog window is as follows:



Subtest 09 Cache Memory

The test item is to check whether the CPU internal cache memory could be accessed correctly.

Subtest 10 Random Memory

Random Memory test includes the following two test items: Randomize Test and Random Incremental Read/Write Test. The parameter dialog window is the same as that in 'Subtest 03 Extended Pattern'.

1. Randomize Test

   This test item is to check whether the memory could be correctly accessed with randomized data and randomized memory address.

2. Random Increment Read/Write

This test item is to check whether the memory could be correctly accessed with randomized memory address and a series of incremental data.

Subtest 11 Data Bus Test

This test item is to check whether the data bus works normally.

Subtest 12 Memory Speed Test

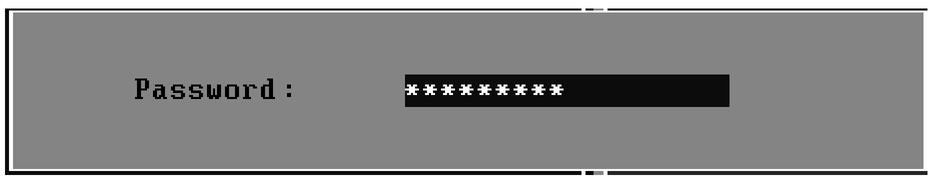
This test item is to check the data-transferring rate for the cache memory and the system memory.

3.7 Storage

Subtest 01 HDD

This test item runs on IDE hard disks. It checks the functions and performance of IDE hard disk.

In order to protect user's HDD data, the password must be verified before the HDD test. The screen is as follows:

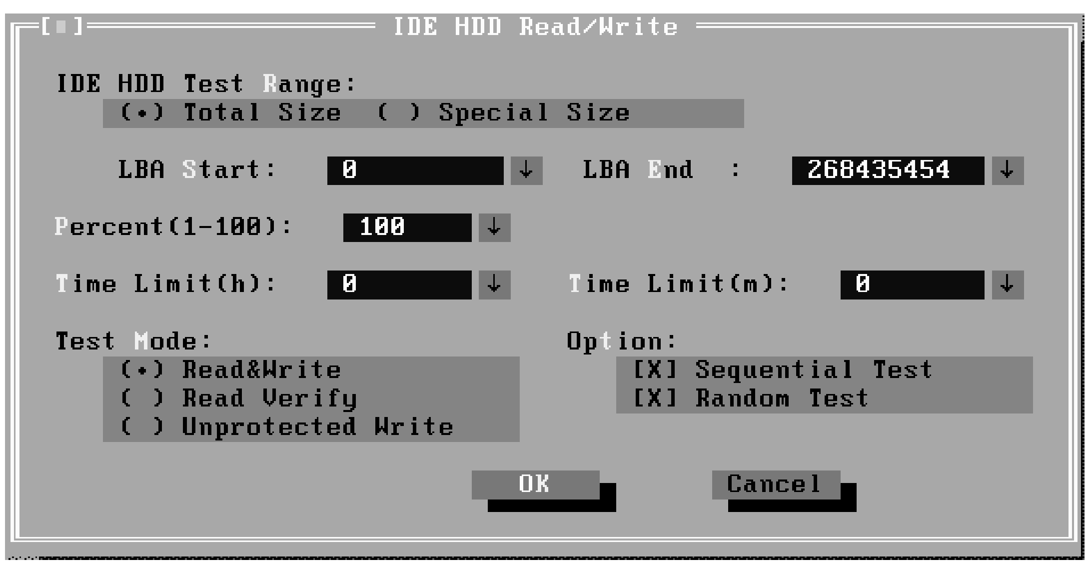


Password：hard disk

1. Sequential/Random R/W

   This test item is to check the HDD's Read/Write function through data writing and reading to HDD.

   This test item needs user to submit the parameters:



IDE HDD Test Range-- Specify the test coverage range of IDE HDD. If user chooses Total Size, it means that the whole IDE HDD will be tested. Although user can input the parameter into other select box, but the selected result is invalid. If user chooses Special Size, the test of IDE HDD will be taken according to the coverage range that user chooses or time.

LBA Start, LBA End--Specify the start and end byte in LBA (Large Block Address).

Percent—Specify the coverage rate in percentage of the total disk.

Time Limit(h): Choose or Input the time (hour) of the defined range of the total disk to be tested.

Time Limit(m): Choose or Input the time (minute) of the defined range of the total disk to be tested.

Test Mode—Choose test mode from the following options:

(1) Read & Write –Write data on the disk, then read it out and compare the two value;

(2) Read Verify —Read data only;

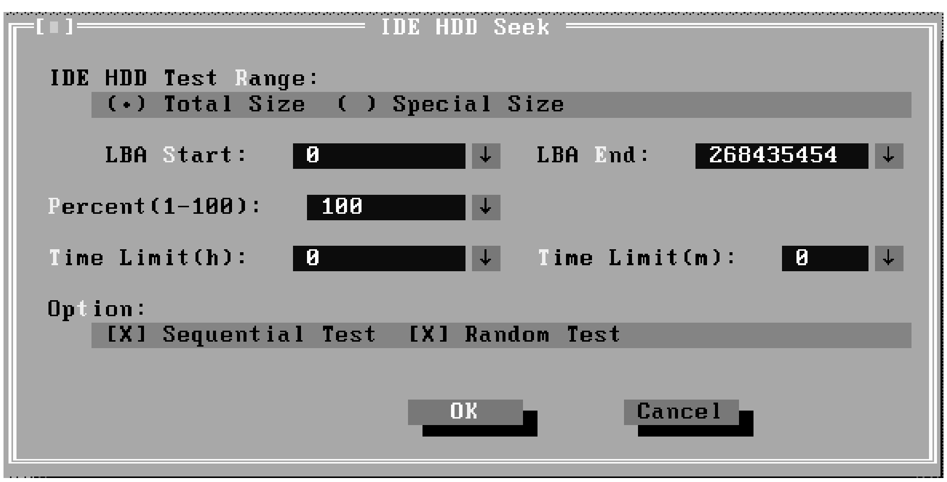
(3) Unprotected Write—Write data on the disk without backup original data.

Option—Select sequential test or random test

2. Sequential/Random Seek

The test item is to check the correctness of the HDD's sector's seeking function.

This test item involves the following parameters:



IDE HDD Test Range—is same as the description of the upper item.

LBA Start, LBA End-- specify start and finish byte in LBA(Large Block Address);

Option-- Select sequential test or random test;

Percent-- Specify the coverage rate in percentage of the total disk.

Time Limit(h): Choose or Input the time (hour) of the defined range of the total disk to be tested;

Time Limit(m): Choose or Input the time (minute) of the defined range of the total disk to be tested.

3. Performance

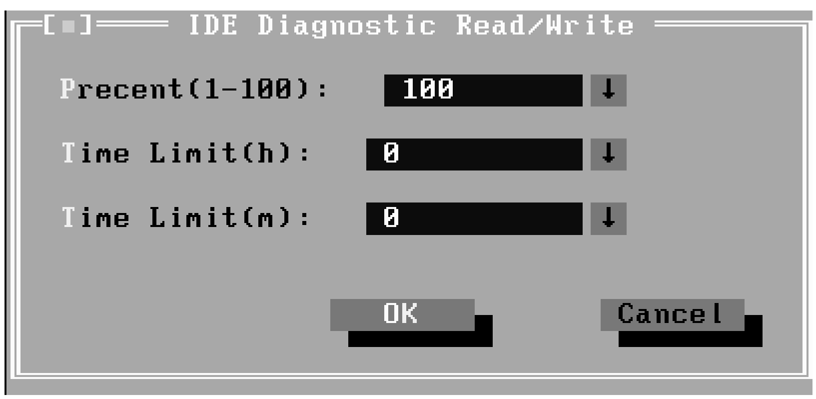
   Check the HDD's seeking speed and transfer the data rate.

4. Controller Check

   Check the HDD controller's status, including HDD interrupt and unexpected interrupt.

5. Diagnostic Read/Write

   This test item is a quick test to verify whether the HDD could be correctly accessed and the user could specify the percentage in the below dialog.



Percent (1-100)-- Specify the coverage rate in percentage of the total disk.

Time Limit(h): Choose or Input the time (hour) of the defined range of the total disk to be tested;

Time Limit(m): Choose or Input the time (minute) of the defined range of the total disk to be tested;

6. SMART Test

   SMART stands for Self-Monitoring, Analysis and Reporting Technology. SMART test will compare the attribute values with the threshold value in the HDD's controller to confirm whether there is any failure in the HDD

Subtest 02 ODD

The ODD test runs on IDE CDROM/DVD-ROM & CD-RW. It will check the ODD driver's functionality and performance.

1. Controller Test

   Check the CDROM controller's status.

2. Data Transfer Rate

   Check the data transfer rate of the ODD drive. It will read data from the ODD disc and calculate the data transfer rate. This test needs a data CD.

3. Data CD Butterfly Seek

   Check the seek function of the ODD drive. It will perform a serial of seeking operations. First, locate the minimum LBA address, then the maximum, the sub-minimum, the sub-maximum and meet at center point. This test needs a data CD.

4. Data CD Random Seek

   Check the random seek function of ODD drive. Random access will reflect the performance of the heads' random movement and seek. It tests for 1000 times.

5. Data CD Sequence Seek

   Check the sequential seek function of ODD drive. Perform location test to CD-RW under LBA mode with the location address increasing in sequence.

6. Tray Eject Test

   Check the eject function of the ODD. It will eject the ODD and ask the user to confirm if the operation succeeds.

3.8 Video

This test item tests the video by:

1. displaying the figures in different graphic modes.
2. displaying the property and color of the characters in different text modes.

User will confirm whether each video mode works normally by judging whether the display is correct. It checks whether the video memory works normally by writing data into the video memory, then reading it out and comparing the two value.

Subtest 01 Text Mode

1. Character Test

   Tests two types of font patterns.

   Font 9*14

   Font 9*16

   It requires the user to check whether all characters of each font type displayed correctly by answering the questions prompted on screen. It will be displayed as follows:.



2. Text Attribute

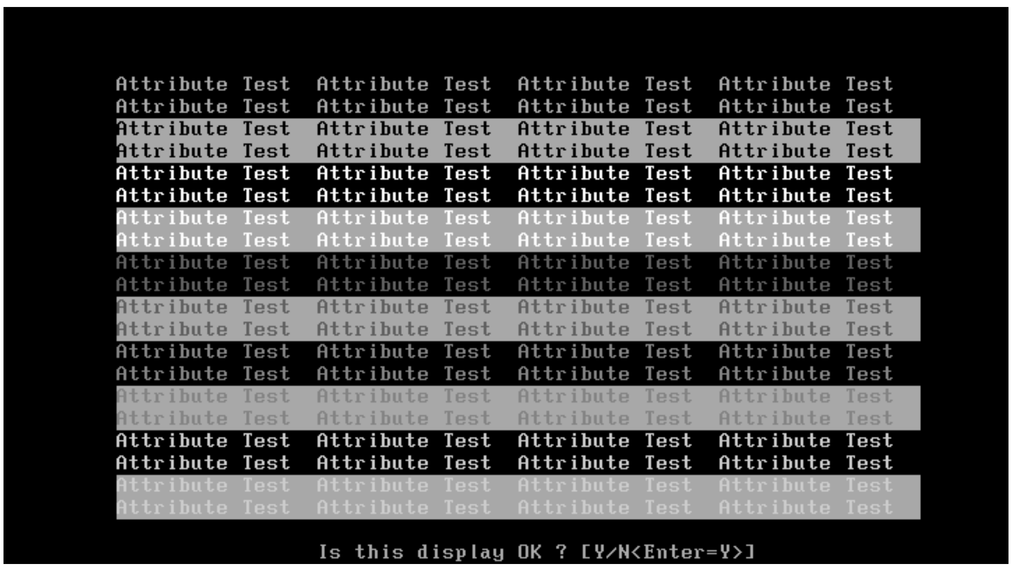
   This test item is to check whether the text attribute of normal, hi-intensity, inverse, and blinking in VGA text mode could be correctly displayed on the screen.

It would display the below texts of the different attributes in the screen:

1. Text in normal attribute;
2. Text in blinking normal attribute;
3. Text in inverse attribute;
4. Text in blinking inverse attribute;
5. Text in hi-intensity attribute;
6. Text in blinking hi-intensity attribute;

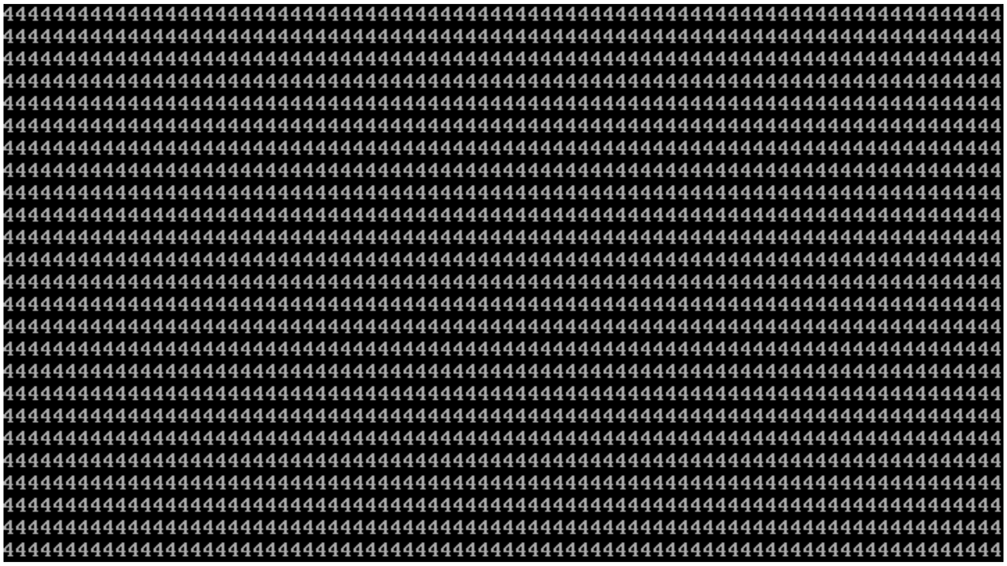
Users need to check whether all texts displayed correctly in the above six attributes and key in the answer 'Y' or 'N' to the prompts 'Is this display OK? [Y/N<Enter=Y>]'.

Below is the test screen of Text Attribute.



3. Text Page Selection

This test item is to check whether the video memory could be correctly written and read in VGA text mode. According to the comparison of written data with read data, the program would report PASS or FAIL.



4. Text Color

   This test item is to check whether all 16 colors foreground and all 8 colors background works normally in VGA text mode.

   The bit4-6 of the attribute byte of a character defines 8 background colors (black, blue, green, cyan, red, brown, magenta, and light gray), and the bit0-3 defines 16 foreground colors (dark gray, light blue, light green, light cyan, light red, light magenta, yellow, and white besides the above 8 colors).

   In the test, user is required to respond according to the instruction in the screen.



5. 80 * 25 Text Mode

This test item is to check whether 80*25 Text Mode works normally.

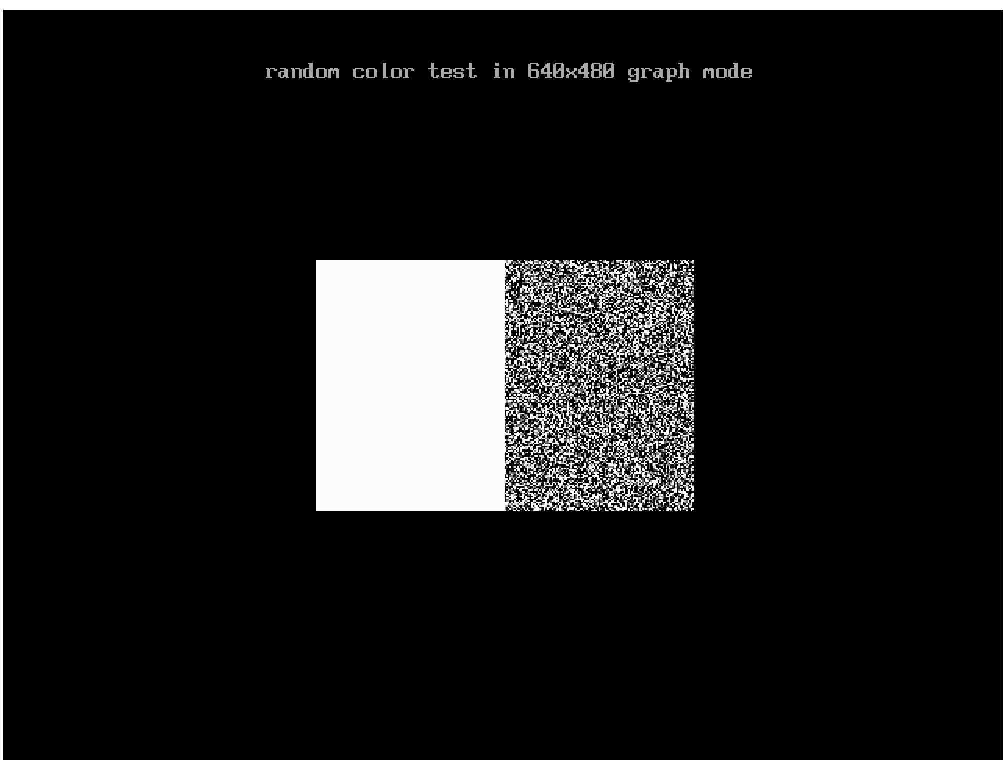
In the test, user is required to respond according to the instruction in the screen.



Subtest 02 640 * 480 VGA Mode

This test item is to check whether 680*480 VGA Text mode works normally.

In the test, user is required to respond according to the instruction in the screen.

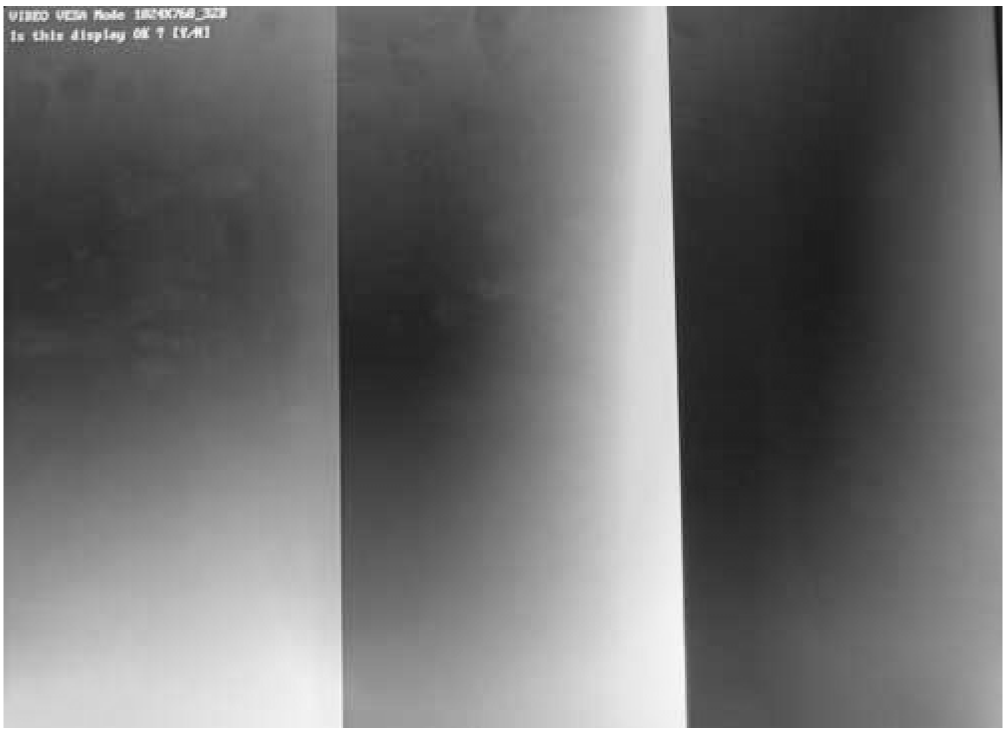


Subtest 03 VESA Video Modes

This test item is to check whether all the video modes supported by the video card works normally.

In the test, user is required to respond following the instruction in the screen.

1. 640X480 Video Modes Test



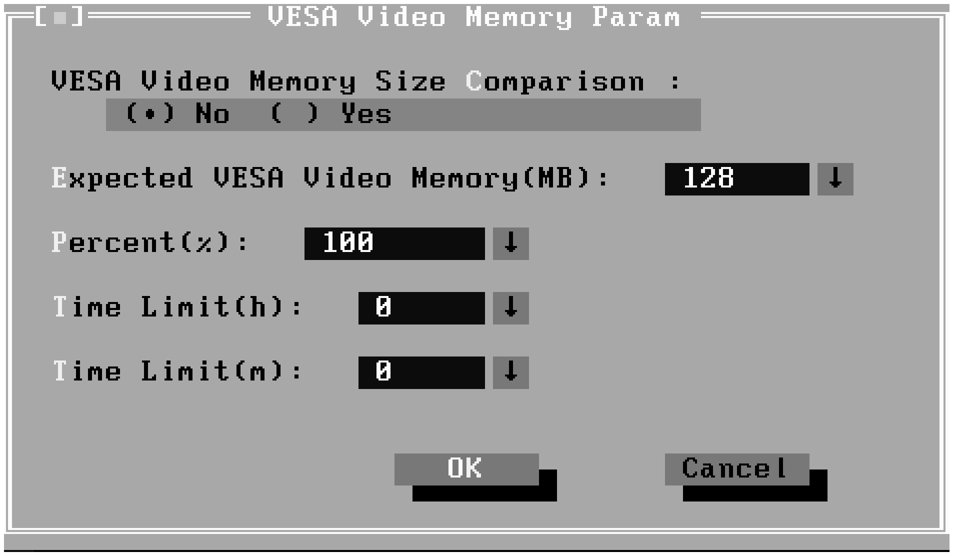
2. 800X600 Video Modes Test

3. 1024X768 Video Modes Test

4. 1280X800 Video Modes Test

Subtest 04 VESA Video Memory

This test item is to check whether VESA video memory could be correctly accessed (write data & read data). Below is the test item’s parameter dialog window:



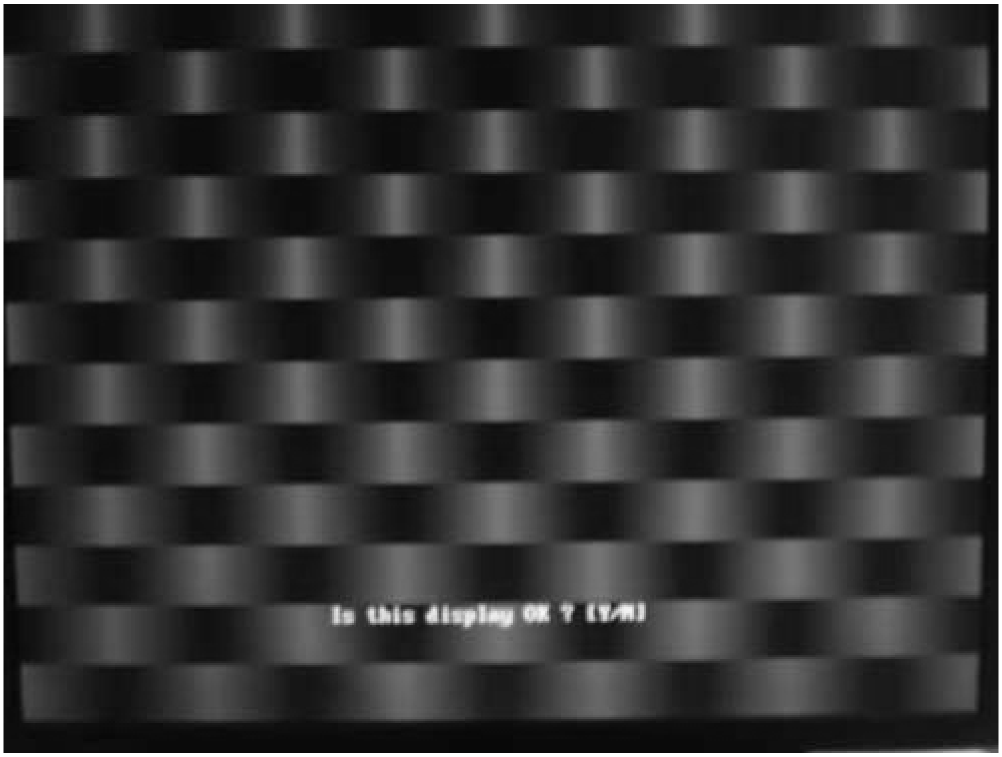
If press Ctrl+Break to force the test to terminate during execution of VESA Video Memory, the test program will not operate and display properly in further tests.

Subtest 05 AGP Test

This test item is to report the system's Accelerated Graphics Port status and check whether AGP registers works normally.

Subtest 06 LCD Panel Test

This test item is to check whether there is any fault in its resolution by displaying the RGB gradient color screens.



Subtest 07 Register Test

This test item is to check whether the registers of the video adapter works normally.

Subtest 08 Color Purity Test

This test item is to check whether the system (the video adapter and the display) could display the purity color of red, green, blue, black and white.

In the test, user is required to respond according to the instruction in the screen.

Subtest 09 Direct Color Test

This test item is to check the video adapter's composing ability of direct color in high and true color mode.

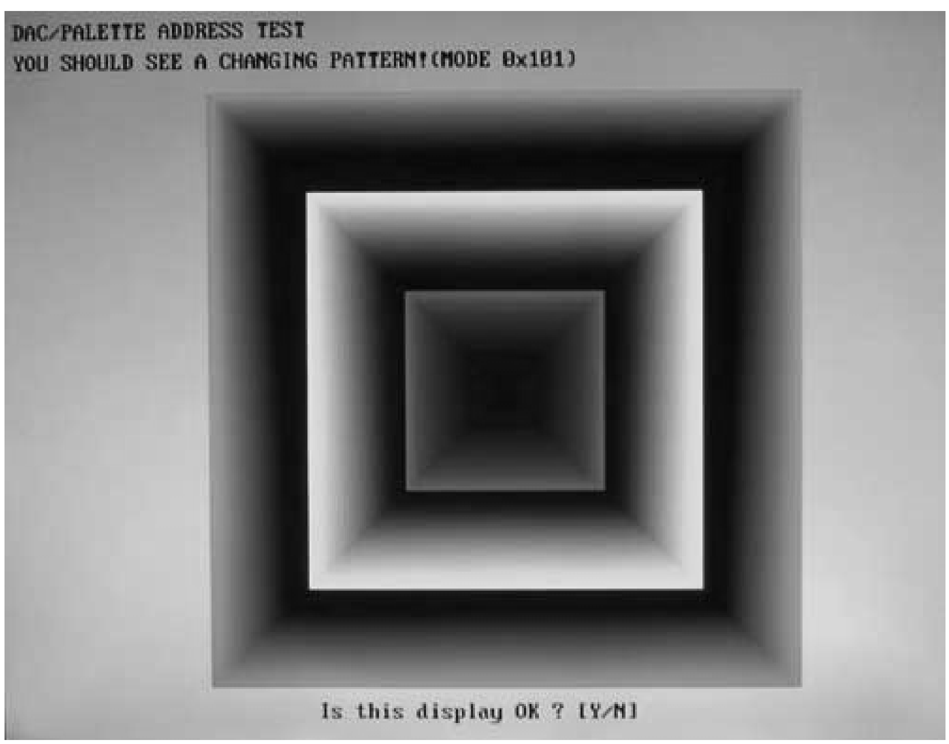
In the test, user is required to respond according to the instruction in the screen.



Subtest 10 DAC/Palette Address

This test item is to check the function of DAC registers and Palette registers.

In the test, user is required to respond according to the instruction in the screen.



3.9 Communication (COMM)

Subtest 01 LAN Card

This test item is to check whether the module can detect the existence of the network card and display its related information.

1. Device ID Detection

   Detect the device ID of the network card.

2. Vendor ID Detection

   Detect the vendor ID of the network card.

3. MAC Address Detection

   Detect the MAC address of the network card.

Subtest 02 1394

GUID Detection

This test item is used to read and display GUID from 1394 register.

3.10 Peripheral

Subtest 01 Keyboard

This test item is to check whether the keyboard works normally.

1. Keyboard Data Line Test

   Check whether the keyboard data line works normally.

2. Keyboard Clock Line Test

   Check whether the keyboard clock line works normally.

Subtest 02 Mouse Test

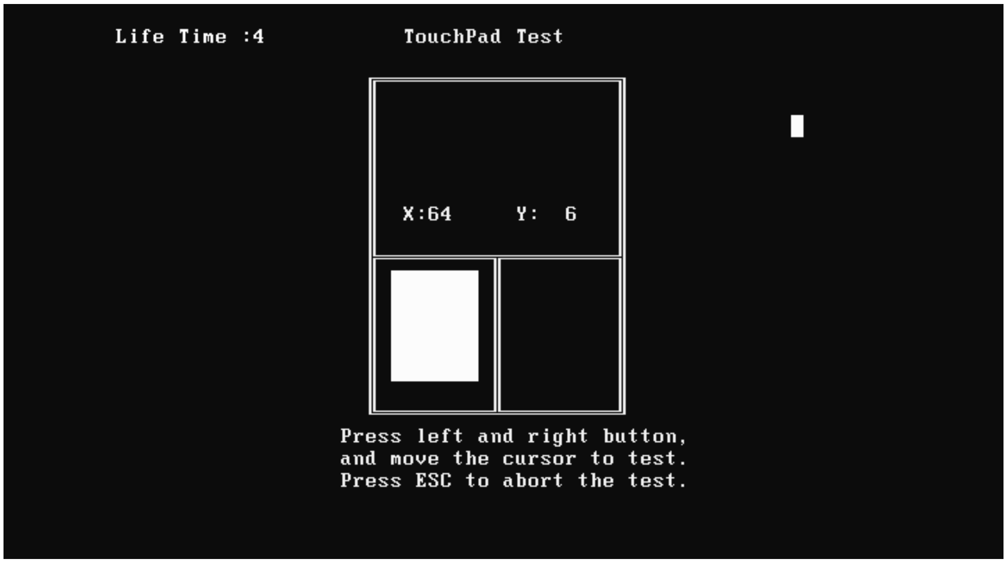
Check whether the point devices work normally.

1. Touch Pad

   Before test Touch Pad's function, user should set a timeout time at below screen:



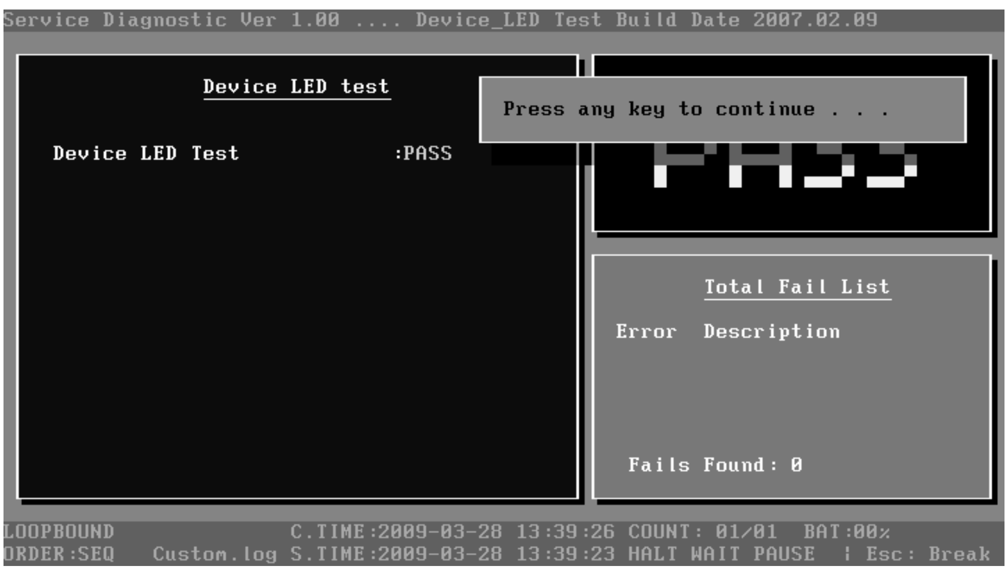
At the below screen of Touch Pad test, user can press the left button, right button, and move the mouse to verify its functions for times, and the test will end either by user break or test time is out.



Subtest 03 Led Test

1. Led Test

Check whether the Device led works normally.



3.11 Error Codes and description

The format of 'Error Code' is 'ddxxee', and 'dd' is the device ID (1~2 chars), 'xx' is test function ID of device (2 chars), 'ee' is the error code of device (2 chars); the range of error code is from 01 to 99 in each device (the common error codes in all device are set to 99 and spanned).

Device	Error Code	Description	Cause	Action
ddxx	**ee**	**Common Error**		
	94	Interactive Mode Needed	The test is not under interactive mode.	Check whether the interactive test mode is adopted.
01xx		**CPU**		
	01	CPU General Function Error	The CPU General Function register is damaged.	Replace the CPU.
	02	CPU Arithmetic Error	The CPU Arithmetic Register is damaged.	As above.
	03	CPU Logic Error	The CPU Logic Register is damaged.	As above.
	04	CPU Type Error	The CPU Type is not supportable.	Check whether the CPU is Intel CPU.
	05	CPU Speed Error	The CPU speed differs from the expected value.	Check the CPU speed and the set expected speed.
	06	NPU General Function Error	The NPU arithmetic unit is damaged.	Replace the CPU.
	07	NPU Interrupt Error	The NPU is damaged.	As above.
	08	CPU Information Error	Information of the CPU cannot be acquired.	Check whether the CPU is Intel CPU.
	09	Protected Instruction Error	The CPU is damaged.	Replace the CPU.
	21	MMX Test Error	The CPU MMX register is damaged.	Replace the CPU.
02xx		**Memory**		
	01	Read Error	The ROM BIOS has Physical problems.	Test this unit on multiple machines.
	02	Write-Protect Error	The ROM BIOS has Physical problems.	As above.
	03	Base Memory Error Address	The test pattern read out from the base memory is different from the one that has been written in this address.	Test this memory chip on multiple machines.

	04	(XMS)Memory Problem	The test pattern read out from the extension memory is different from the one that has been written in this address.	As above.
	05	(XMS) Out Of Range	Wrong parameters setup.	Check and reset the parameters.
	06	Address Test Error	Interference between different address channels.	Test this memory chip on multiple machines.
	07	Toggle Bit Error	Errors with the timer chip.	As above.
	08	Interval Error	The acquired refreshing frequency is out of the estimated range.	Reset the estimated range.
	09	L1 Cache test Error	The pattern read out from the L1 Cache is different from the one that has been written in the same address.	Test this unit on multiple machines.
	12	Data Bus Error	Interference between different data channels.	As above.
	14	Speed Error	Failure during the transfer speed test.	As above.
03xx		**Board**		
	01	DMA Test Error	DMA channel cannot transfer data normally.	Repeat multiple times. Whether there is always the same error, replace the board.
	04	Interval Timer Error	The difference between the actual precision of the interval timer and its theory value is out of the permitted range. The timer counts imprecisely.	As above.
	05	Periodic Faster Error	The frequency is beyond the standard.	As above.
	06	Periodic Slower Error	The frequency is below the standard.	As above.
	07	Update-ended Interrupt Error	R/W errors with the RTC refreshing interrupt controller.	As above.
	08	RTC Alarm Error	The PC speaker's sound source ---counter/timer 8253 cannot produce corresponding timing signal.	As above.
	13	PCI Bus Error	No PCI.	Check the board.
	14	PCI Bus Scan Error	PCI test fails.	As above.
	15	PCI Device Access Error	PCI access fails.	As above.
	16	PCI Config Verification Error	Wrong PCI configuration.	Check PCI configuration on main board or PCI Device

				configuration.
	17	PCI to ISA Bridge Error	PCI-ISA bridge errors.	Repeat multiple times. If there is always the same error, replace the board.
	18	ESCD Error	ESCD errors.	As above.
	53	ACPI Table Test Error	Errors with the ACPI table test.	As above.
34xx		**FAN**		
	01	Fan Slow Speed Test Fail	The fan slow speed test fails.	Check the FAN connection.
	02	Fan Stop Test Fail	The fan stop test fails.	As above.
	03	Fan Fast Speed Test Fail	The fan fast speed test fails.	As above.
04xx		**Video**		
	01	Text Attribute Error	Physical problems with the video card.	Check whether there is any physical problem with the video card.
	02	Text Page Selection Error	As above.	As above.
	03	Text Color Error	As above.	As above.
	04	Text Mode Error	As above.	As above.
	05	VGA Mode Error	1) Physical problems with the video card. 2) Physical problems with the monitor.	1) Check whether there is any physical problem with the video card. 2) Check whether there is any physical problem with the monitor.
	06	Character Test Error	Physical problems with the video card.	Check whether there is any physical problem with the video card.
	07	DAC/Palette Address Test Error	As above.	As above.
	08	Color Purity Test Error	Physical problems with the video card or the monitor.	Check whether there is any physical problem with the video card or the monitor.
	09	VESA Mode 15bits Direct Color Test Error	As above.	As above.
	10	VESA Mode 16bits Direct Color Test Error	As above.	As above.
	11	VESA Mode 24bits Direct Color Test Error	As above.	As above.
	12	Get the PCX graphics map Error	Failure in getting PCX graphics map.	Check for the PCX graphics map.
	13	Bitblt Engine Test Error	Physical problems with the video card.	Check and see whether the video card has any physical problem.
	14	VESA Video Memory Test Error	As above.	As above.

	15	VESA VRAM Test Error	Physical problems with the video card or the monitor.	Check whether there is any physical problem with the video card or the monitor.
	16	AGP Test Error	AGP configuration register errors.	Check and see whether the AGP video card has any physical problem.
	17	LCD Panel Test Error	Lower LCD color resolution.	Replace the LCD.
	19	Register Test Error	Physical problems with the video card.	Check and see whether the video card has any physical problem.
	20	Adapter not support DDC	The video card doesn't support DDC.	
	21	Monitor not support DDC	The monitor doesn't support DDC.	
	21	8bits Text and Attribute Test Error	1) Physical problems with the video card. 2) Physical problems with the monitor.	1) Check and see whether the video card has any physical problem. 2) Check and see whether the monitor has any physical problem.
	26	8bits Video Mode Test Error	As above.	As above.
	27	15bits Video Mode Test Error	As above.	As above.
	28	16bits Video Mode Test Error	As above.	As above.
	29	24bits Video Mode Test Error	As above.	As above.
	30	32bits Video Mode Test Error	As above.	As above.
31xx		**Audio**		
	01	Audio Play Fail	Cannot play music.	Check the Audio connection, replace the external fixture, and repeat the test.
	02	Record Fail	Cannot record.	As above.
08xx		**LAN Card**		
	01	PCI bus Error during device ID test	Don’t Scan PCI device	Don’t support PCI BIOS
	02	PCI Ethernet card not present during device ID test	Don’t find Net card	Please insert Net cad
	03	Intel PCI Ethernet card not present during MAC test	Don’t found Net Card, This Card can’t be Read MAC by this method	Please update net card or use other method
09xx		**Keyboard**		

	01	Keyboard Map & Stroke Test Fail	Keyboard Map & Stroke Test fails.	Check the KBD connection and repeat the test.
	03	Clock Line Test Fail	Clock Line Test fails.	As above.
	04	Data Line Test Fail	Data Line Test fails.	As above.
05xx		**Mouse**		
	01	Touch Pad Test Fail	Touch Pad Test Fail	Check the mouse connection and repeat the test.
28xx		**1394**		
	01		Can not find IEEE1394 controller	Don't support 1394.
20xx		**IDE-HDD**		
	01	Get Parameter Fail !	Wrong test parameters are input by user.	Reinput the correct parameters.
	02	Write Pattern Error	HD is damaged.	Send the HD for repair.
	03	Data Compare Error	HD is damaged.	As above.
	04	Read Verify Error	HD is damaged.	As above.
	05	Seek Error	HD is damaged.	As above.
	06	Disk Controller Self Test Failed	The HD controller is damaged.	As above.
	07	Disk Controller Test unexpected interrupt Failed	The HD controller is damaged.	As above.
	09	Disk Controller action Test Failed	The HD controller is damaged.	As above.
	10	Disk dos not support SMART	Disk dos not support SMART	Change HD which supported SMART and test again
	11	Disk read attribute threshold error	Disk read attribute threshold error	Send the HD for repair.
	12	Disk read attribute value error	Disk read attribute value error	As above.
	13	Disk SMART attribute value error	Disk SMART attribute value error	As above.
21xx		**ODD**		
	01	No Disk in CDROM	No disk is found in the CD-ROM.	Insert a disk into the CD-ROM.
	02	The Disk in CDROM is not Data Disk	The disk in the CD-ROM is not Data Disk.	Insert a DATA CD.
	03	IDE-CD Controller Error	Functional errors with the CD-ROM.	Send the CD-ROM for repair.
	04	CD Read Error	Either the disk or the CD-ROM is damaged.	Replace the disk or send the CD-ROM for repair.
	07	CD Seek Error	Either the disk or the CD-ROM is damaged.	Replace the disk or send the CD-ROM for repair.

	09	Eject Error	Wrong CD-ROM drive.	Exit from the wrong drive.

3.12 Quick Test Item List

Device	Test Items	Comment
CPU	Basic Functionality	
	NPU Basic Functions	
	CPU Information	
Memory	BIOS ROM	
	Cache Memory	
	Bit Stuck High Test	10% or 3 minutes
	Bit Stuck Low Test	10% or 3 minutes
	Address Test	
Board	Interval Timer	
	Clock / Calendar	
	ACPI Test	
FAN	FAN Speed	
Video	1024X768 Video Modes Test: VESA 1024x768x64K Mode VESA 1024x768x32bit Mode	
	VESA Video Memory	10% or 3 minutes
	Color Purity Test	
	Direct Color Test	
	LCD Panel	
HDD	Sequential/Random Read	25% or 3 minutes
	SMART Check	
LAN Card	Device ID Detection	
	Vendor ID Detection	
	Mac Address Detection	

Chapter 4

Replacement Procedures

Chapter 4 Contents

Figures

4.9 Ix Top Cover

Removing the Top Cover

Remove the top cover according to the following procedures and Figures 4-13, 4-14 and 4-15.

1. Turn the computer upside down and remove the following 17 screws:
   - Fifteen M2.5x6 black flat head screws and two M2.5x2.5 black flat head screws.

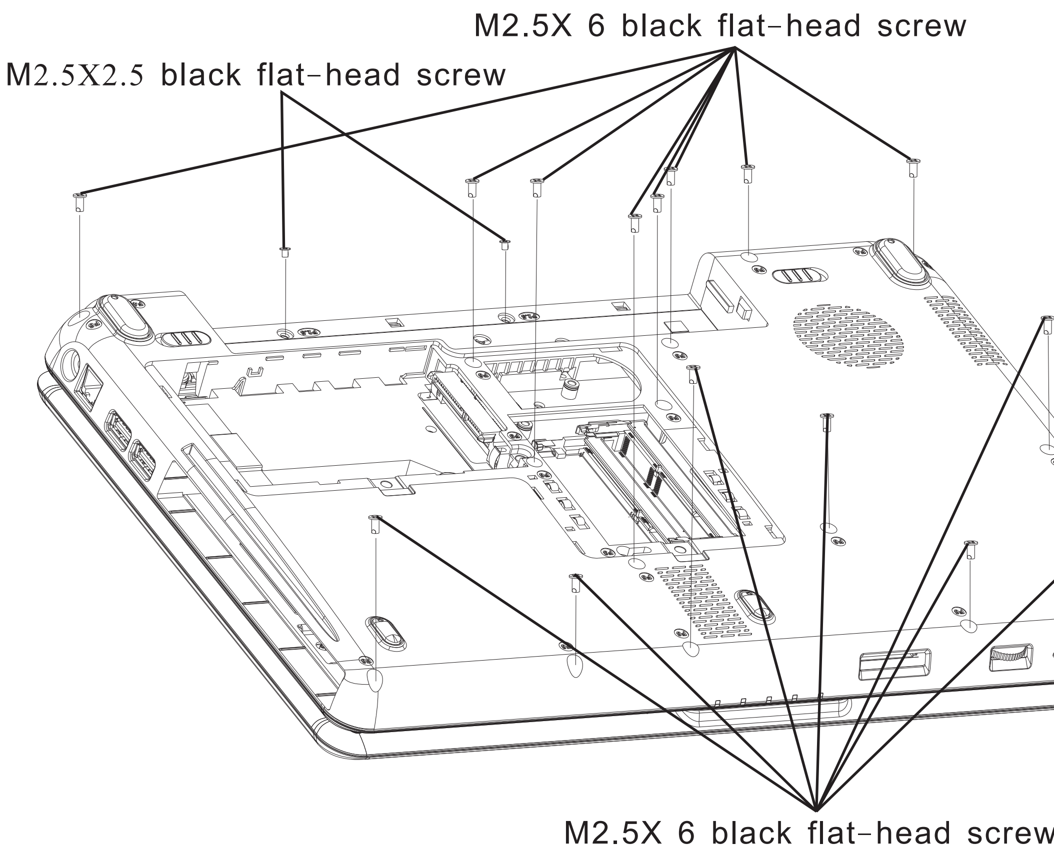


Figure 4-13 Removing the screws from the bottom of the computer

2. Turn the computer right side up.
3. Disconnect the touch pad board flat cable from CN6005.
4. Disconnect the switch board flat cable from CN6002.
5. Disconnect the speaker cable from CN601
6. Remove one M2.5x3.5 white flat-head screw.
7. Lift up the top cover.

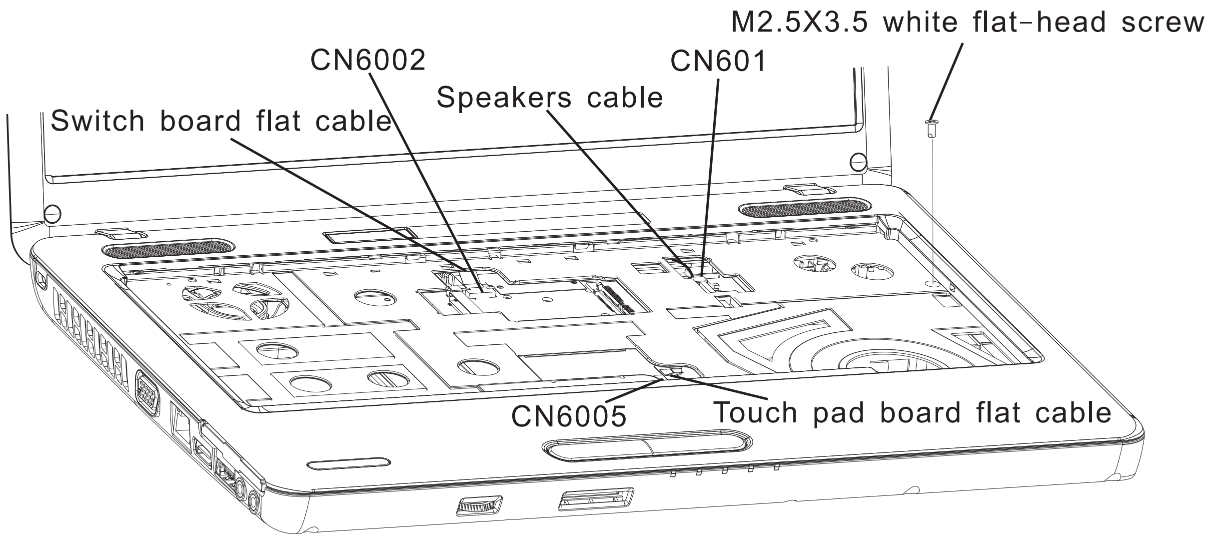


Figure 4-14 Removing the top cover

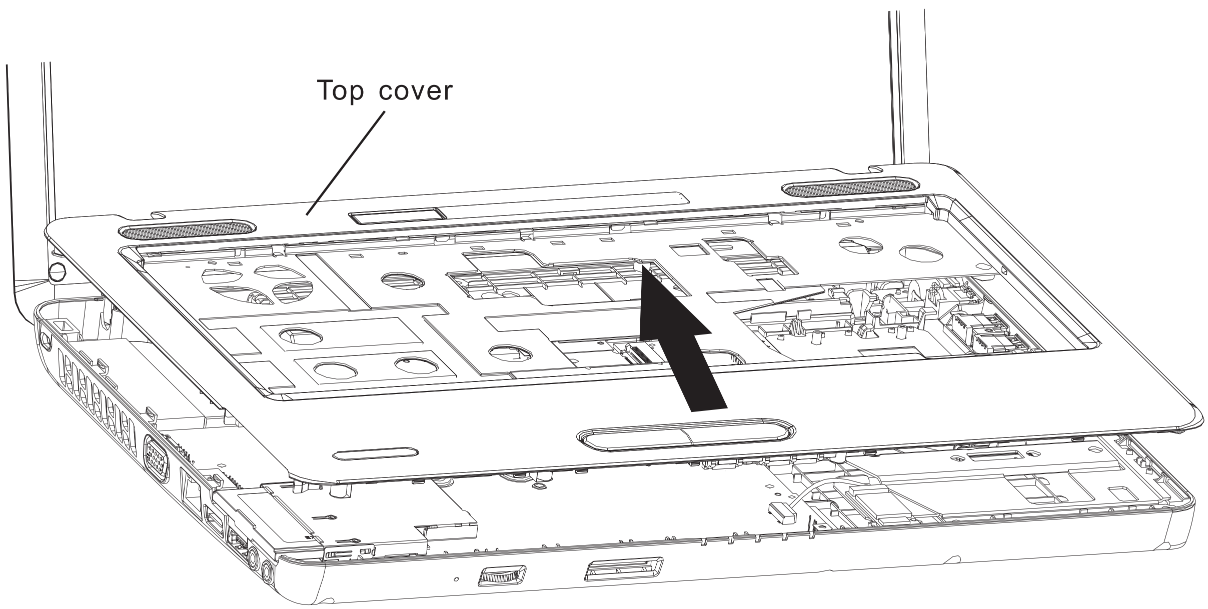


Figure 4-15 Removing the top cover

Installing the Top Cover

Install the top cover with the display assembly according to the following procedures and Figures 4-13, 4-14 and 4-15.

1. Seat the top cover, adjusting its position.
2. Connect the touch pad board flat cables to CN6005 on the system board.
3. Connect the switch board flat cable to CN6002 on the system board.
4. Connect the speaker cable to CN601 on the system board.
5. Secure the top cover with M2.5x3.5 white flat-head screw.

Turn the computer upside down and secure it with the following 17 screws:
- Fifteen M2.5x6 black flat head screws and two M2.5x2.5 black flat head screws.

4.10 Display Assembly

Removing the Display Assembly

***CAUTION**: Use care to avoid that the antenna cable is not caught between the display assembly and computer.*

Remove the display assembly according to the following procedures and Figures 4-16, 4-17.

1. Turn the computer so the back is facing you and remove two M2.5x4 black flat head screws.

2. Restore the normal computer placement and open the display panel.

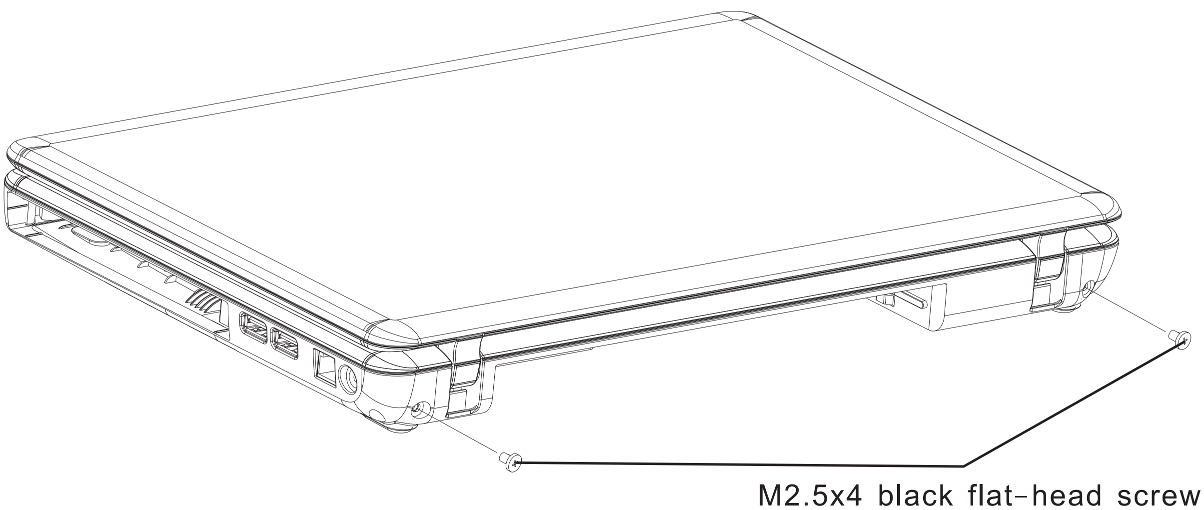


Figure 4-16 Removing the screws from the back of the computer

3. Disconnect the LCD/FL cable from CN6 on the system board.

4. Disconnect the CCD cable from CN4 on the system board.

5. Disconnect the MIC cable from CN600 on the system board.

6. Remove four M2.5x4 black flat head screws securing the LCD module to the bottom cover.

7. Remove the wireless antenna cables, CCD cable and MIC from the bottom cover.

8. Remove the display module.

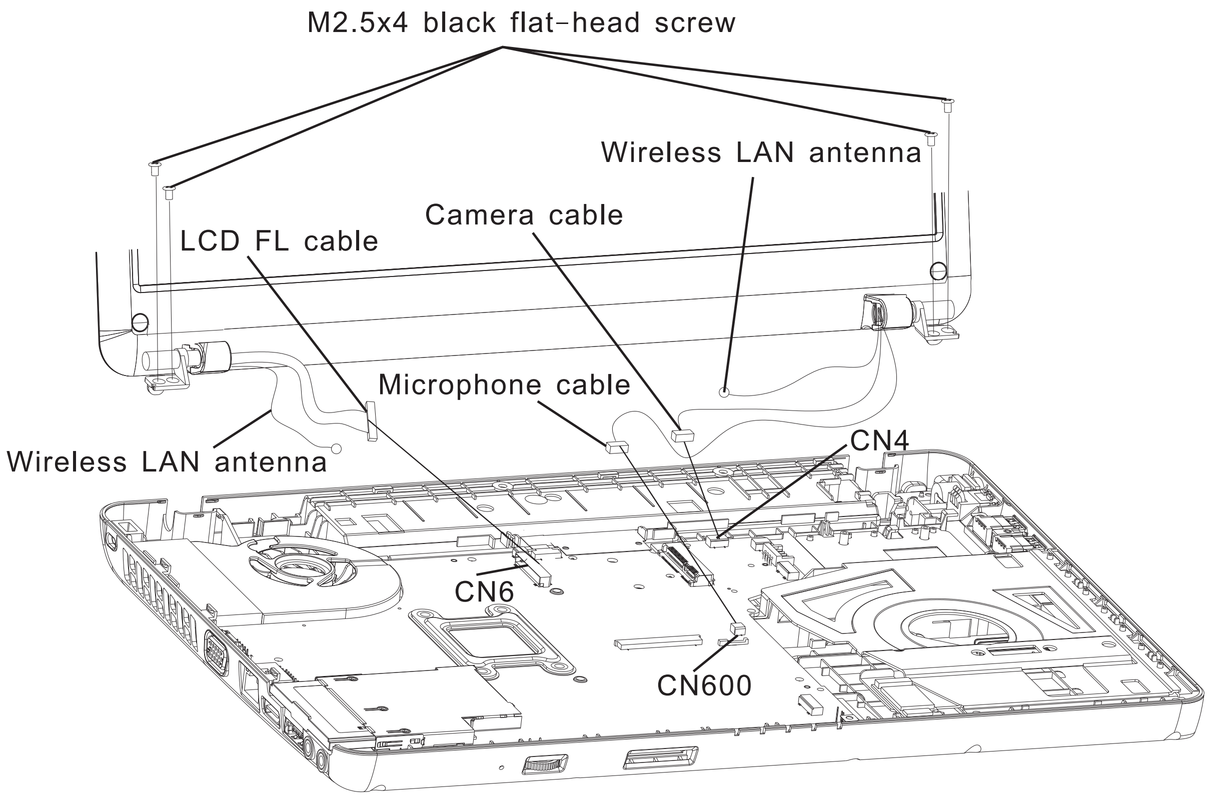


Figure 4-17 Removing the display assembly

Installing the Display Assembly and ODD Extended Board

Install the display assembly according to the following procedures and Figures 4-16, 4-17.

1. Place the display panel in the correct position and push the wireless antenna cable, CCD cable and MIC cable into the bottom cover.
2. Connect the LCD/FL cable to CN6 on the system board.
3. Connect the CCD cable to CN4 on the system board.
4. Connect the MIC cable to CN600 on the system board.
5. Secure the display assembly with four M2.5x4 black flat head screws.
6. Close the display panel and turn the computer so the back is facing you and secure two M2.5x4 black flat head screws.

4.11 System Board, DC-IN Cable, RJ11 cable, USB cable and Bluetooth card

Removing the System Board, DC-IN Cable, RJ11 cable, USB cable and Bluetooth card.

NOTE: Be careful of the eject button for the PC card. It can be damaged when removing the board. Make sure it is securely installed.

Remove the System Board, DC-IN Cable, RJ11 cable, USB cable and Bluetooth card according to the following procedures and Figure 4-18.

1. Remove two M2.5x 4 black flat head screw on the USB cable
2. Remove the USB cable from CN18 on the system board.
3. Remove the DC-IN cable from CN6000 on the system board.
4. Remove the RJ11 cable on system board.
5. Remove the Bluetooth card cable from CN19 on the system board.
6. Remove Bluetooth module carefully and avoid damage the double side tape.
7. Remove one M2x3 black flat head screw on the system board.
8. Remove one M2.5x 4 black flat head screw on the fan.
9. Remove the system board.

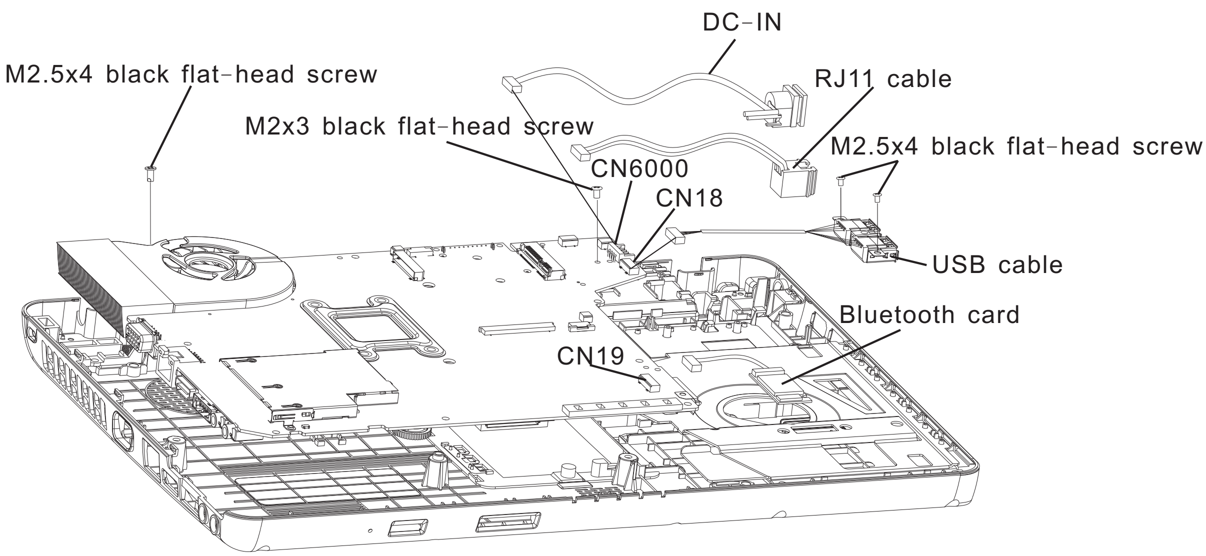


Figure 4-18 Removing the system board

> *NOTE:* ***Don't touch the double side tape for keep double tape surface clean and adhesive while remove the Bluetooth module from ODD bracket, . If the double side tape has no adhesive or broken, please change a new tape. (V000900770).***

Installing the System Board, DC-IN Cable, RJ11 cable, USB cable and Bluetooth card.

Install the System Board, DC-IN Cable, RJ11 cable, USB cable and Bluetooth card according to the following procedures and figure 4-18.

> *NOTE:*
>
> *Be careful of the eject button for the PC card. It can be damaged when installing the system board. Make sure it is pushed in.*

1. Seat the system board in the correct position.
2. Secure the system board with one M2x3 black flat-head screw.
3. Secure one M2.5x4 black flat-head screw on the fan.
4. Seat the Bluetooth card in the correct position and connect Bluetooth card cable to CN19 on the system board.
5. Seat the DC-IN cable in the correct position and connect the DC-IN cable to CN6000 on the system board.
6. Seat the USB cable in the correct position and connect the USB cable to CN18 on the system board.
7. Secure two M2.5x4 black flat-head screw on the USB cable
8. Seat the RJ11 cable in the correct position.

4.12 CPU Cooling Module and Fan

CAUTION: When removing the cooling module, keep the following in mind:
The cooling module can become very hot during operation. Be sure to let it cool down before starting the repair work.
Do not touch or cause damage to the fan in the cooling module.

Removing the CPU Cooling Module and Fan

Remove the CPU cooling module and fan according to the following procedures and Figures 4-19, 4-20, 4-21, 4-22 and 4-23.

1. Remove the fan cable from CN802 on system board.
2. Remove two M2x3 black flat head screws on the fan.
3. Remove the fan.
4. Remove two M2x3 black flat head screws on the CPU cooling module bracket.
5. Remove the CPU bracket.
6. Remove the CPU cooling module.

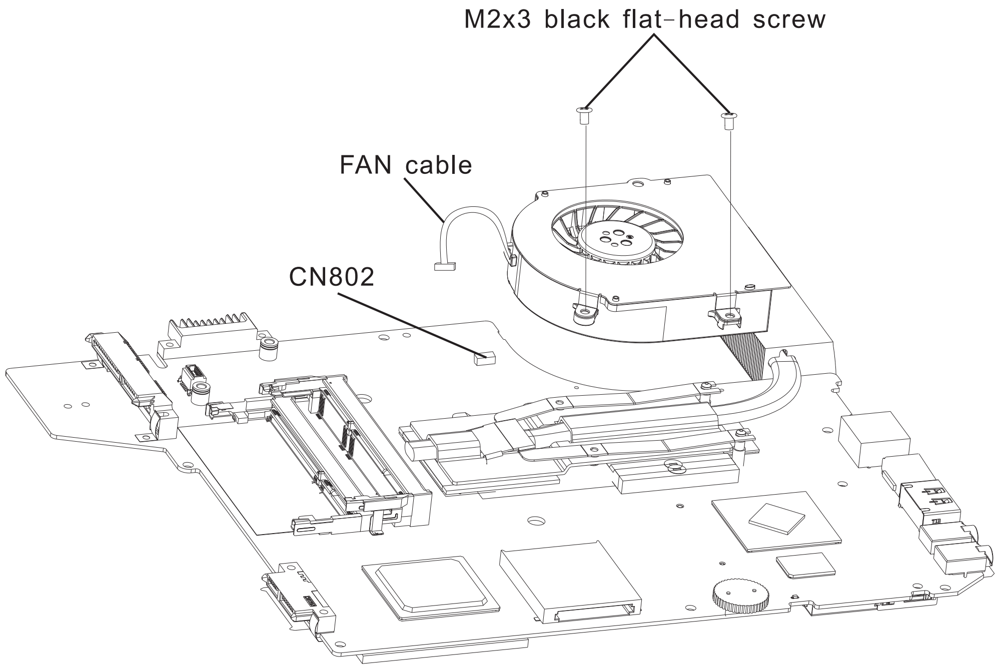


Figure 4-19 Removing the fan

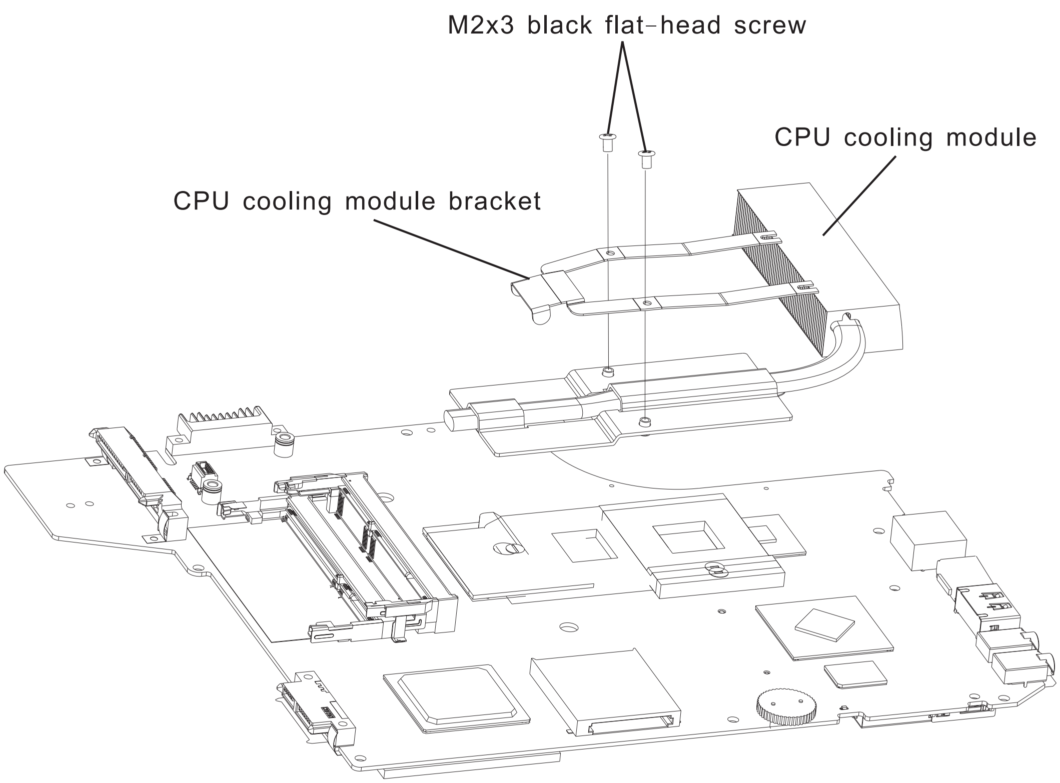


Figure 4-20 Removing the CPU cooling module

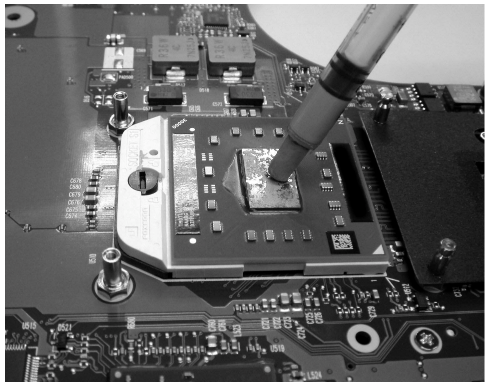


Figure 4-21 Applying silicon grease

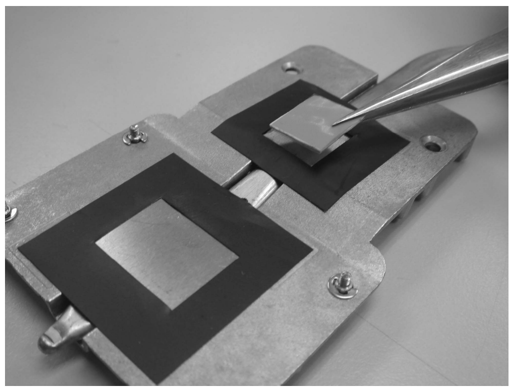


Figure 4-22 Replace new thermal pad into correct position.

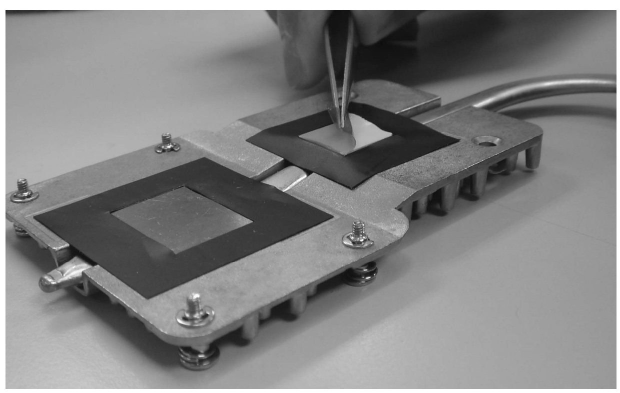


Figure 4-23 Tear down the tape.

Installing the CPU Cooling Module and Fan

Install the cooling Module according to the following procedures and Figures 4-19, 4-20, 4-21, 4-22 and 4-23.

> ***CAUTION: When installing the cooling module, keep the following in mind:***
> ***1. Be sure to confirm the correct position for the module.***
> ***2. Secures the relevant screws on the main board according to the number sequence sealed on heat sink module.***

> ***NOTE: Apply silicon grease with a special syringe to cover the surface of the CPU chip completely.***

1. If silicon grease is already applied to the CPU and fan module, wipe them off with a cloth.
   By using a special syringe, apply silicon grease G7762 to the CPU chip center so that the entire CPU chip is covered with the grease G7762.

2. Install the CPU cooling module into the correct position on the system board.

3. Place the CPU cooling module and bracket in the correct position and secure it with two M2x3 white flat-head screws.

4. Place the fan in the correct position and secure it with two M2x3 black flat head screws.

5. Connect the fan cable to CN802 on the system board.

CAUTION: When removing the cooling module, keep the following in mind:
The cooling module can become very hot during operation. Be sure to let it cool down before starting the repair work.
Do not touch or cause damage to the fan in the cooling module.

Removing the CPU Cooling Module and Fan (For VGA Module)

Remove the CPU cooling module and fan according to the following procedures and Figures 4-24, 4-25, 4-26, 4-27 and 4-28.

1 Remove the fan cable from CN802 on system board.

2. Remove two M2x3 black flat head screws on the fan.

3. Remove the fan.

4. Remove two M2x3 black flat head screws on the CPU cooling module bracket.

5. Remove the CPU bracket.

6. Remove the CPU cooling module.

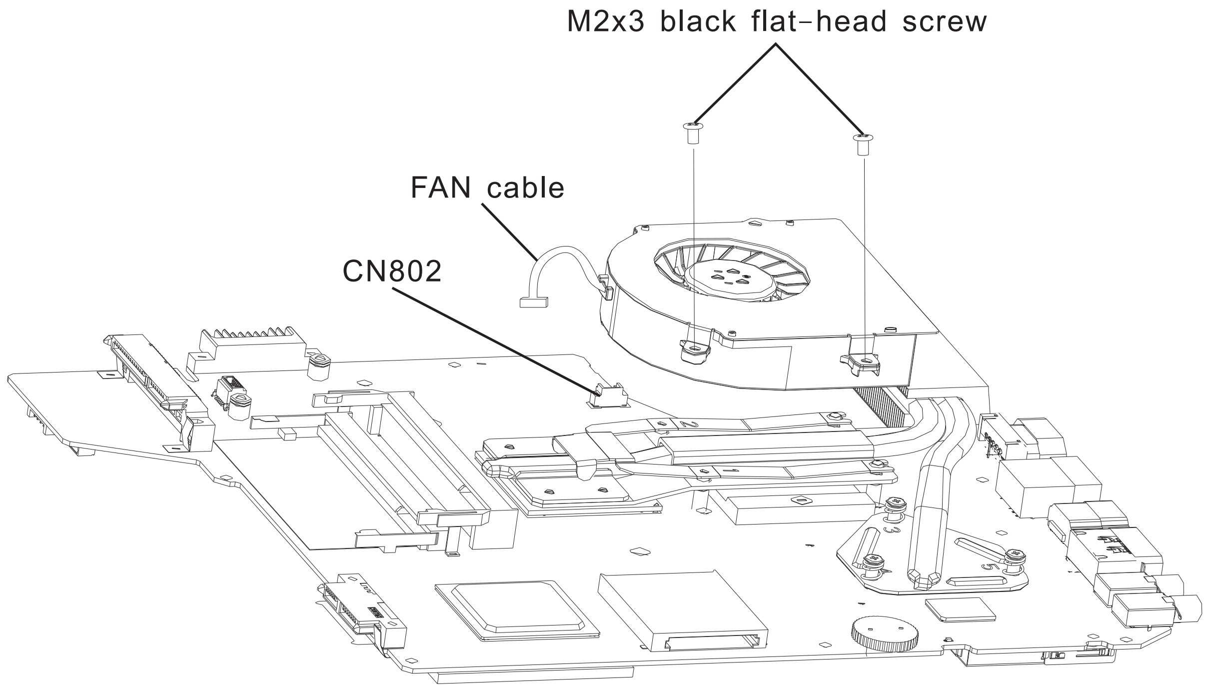


Figure 4-24 Removing the fan

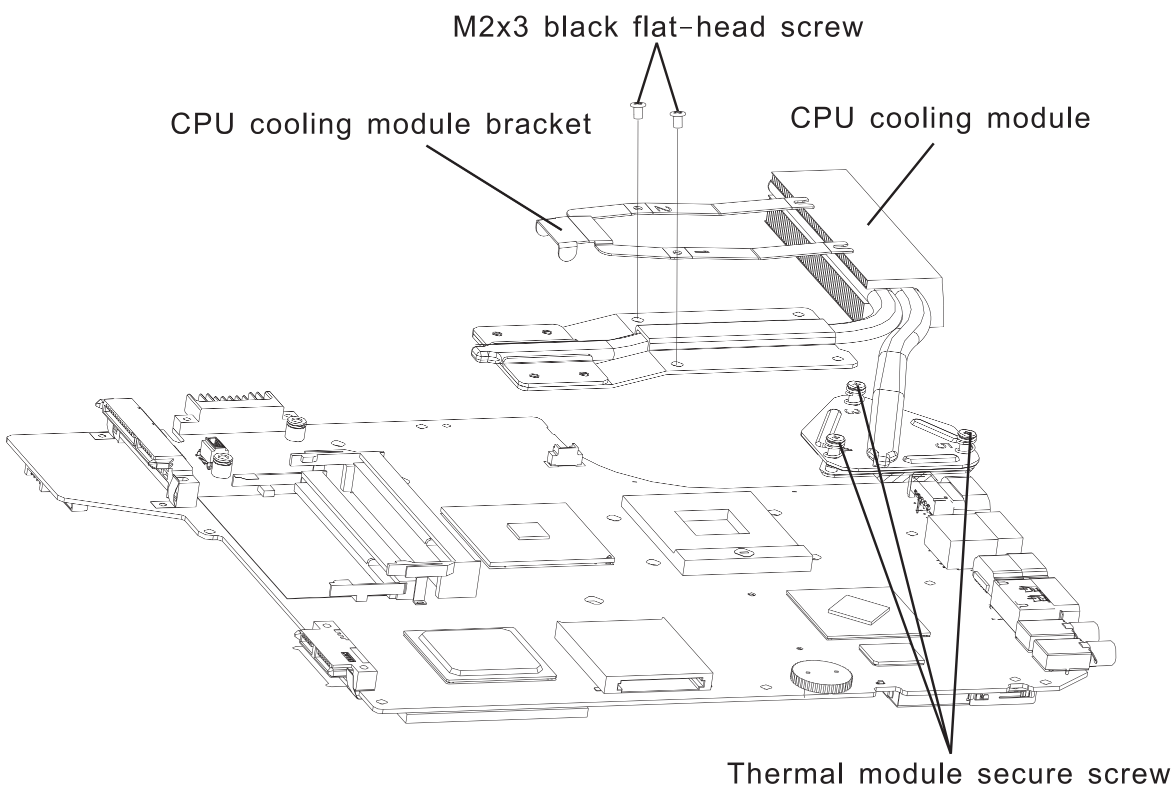


Figure 4-25 Removing the CPU cooling module

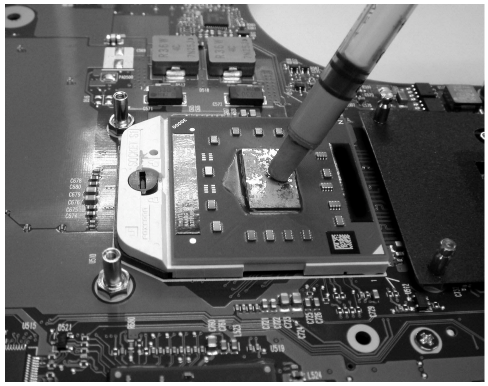


Figure 4-26 Applying silicon grease

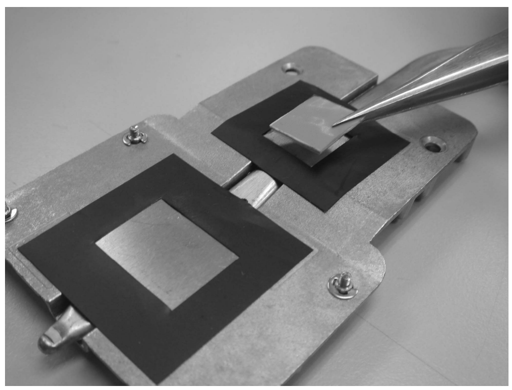


Figure 4-27 Replace new thermal pad into correct position.

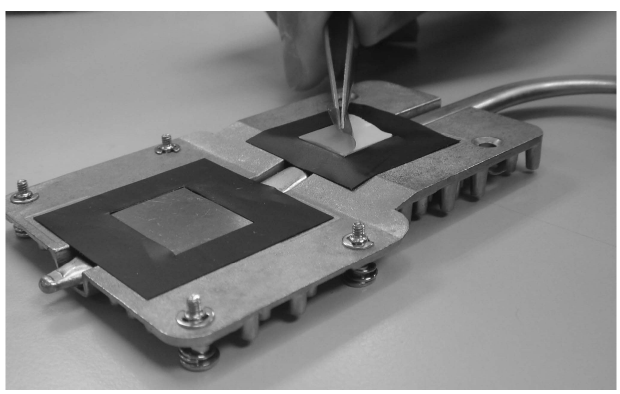


Figure 4-28 Tear down the tape.

Installing the CPU Cooling Module and Fan (For VGA Module)

Install the cooling Module according to the following procedures and Figures 4-24, 4-25, 4-26, 4-27 and 4-28.

CAUTION: When installing the cooling module, keep the following in mind:

1. Be sure to confirm the correct position for the module.

2. Secures the relevant screws on the main board according to the number sequence sealed on heat sink module.

NOTE: Apply silicon grease with a special syringe to cover the surface of the CPU chip completely.

1. If silicon grease is already applied to the CPU and fan module, wipe them off with a cloth.
   By using a special syringe, apply silicon grease G7762 to the CPU chip center so that the entire CPU chip is covered with the grease G7762.

2. Install the CPU cooling module into the correct position on the system board.

3. Place the CPU cooling module and bracket in the correct position and secure it with two M2x3 white flat-head screws.

4. Place the fan in the correct position and secure it with two M2x3 black flat head screws.

5. Connect the fan cable to CN802 on the system board.

4.13 CPU

Removing the CPU

CAUTION: When removing the CPU, keep the following in mind:
The CPU can become very hot during operation. Be sure to let it cool down before starting repair work.

Remove the CPU according to the following procedures and Figures 4-29, 4-30 and 4-31.

NOTE: FOXCONN CPU socket will be 180 degrees to the right.

1. Unlock the CPU by rotating the cam on the CPU socket 120 degrees to the left with a flat-blade screwdriver (in the order shown in the figure below).
2. Remove the CPU.

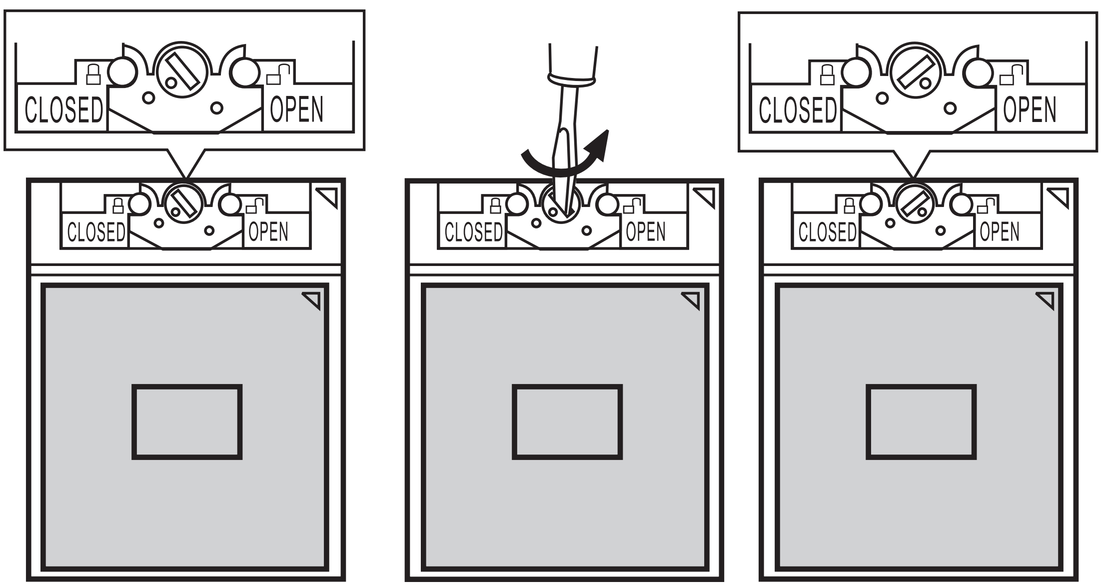


Figure4-29 Removing the CPU

Installing the CPU

Install the CPU according to the following procedures and Figures 4-29, 4-30 and 4-31.

1. Check that the triangle on the cam is in the unlock position.
2. Attach the CPU to the correct position in the CPU socket. Align the CPU with the CPU socket by using the triangle as a guide.

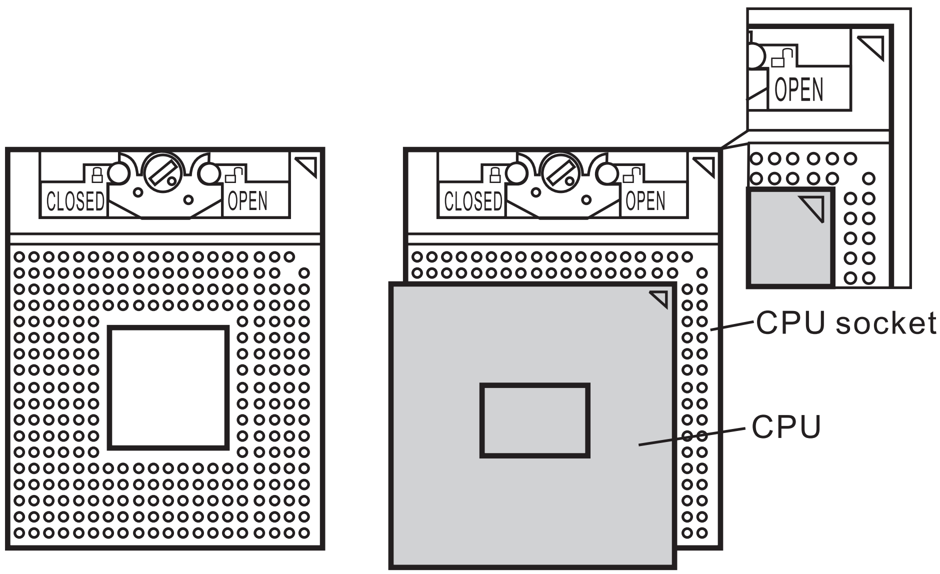


Figure 4-30 Installing the CPU

CAUTION: Seat the CPU by aligning the triangle with the shaded area.

3. Secure the CPU by rotating the cam 120 degrees to the right with a flat-blade screwdriver.

NOTE: FOXCONN CPU socket will be 180 degrees to the left.

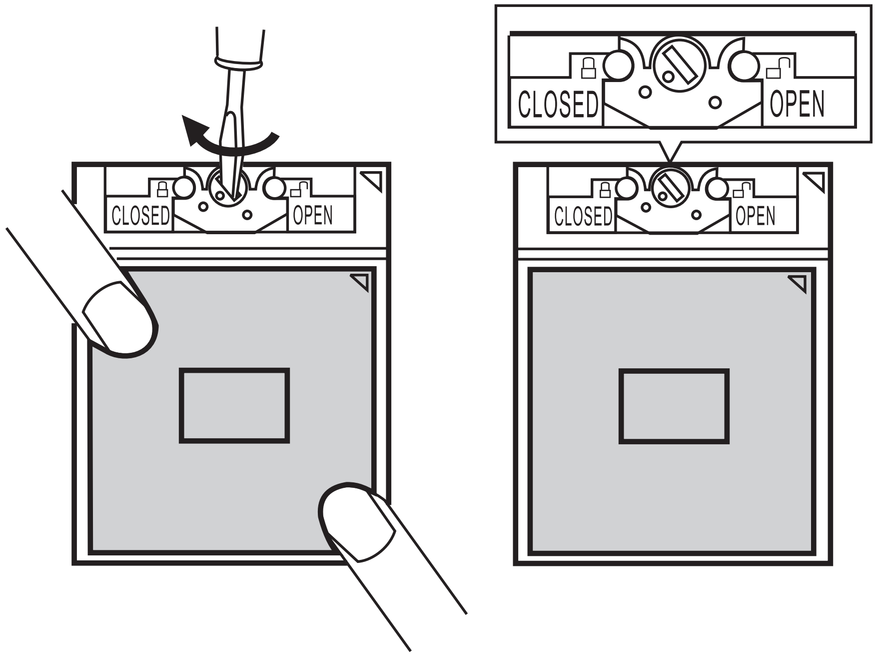


Figure 4-31 Securing the CPU

4.14 Display Mask

Removing the Display Mask

Remove the display mask according to the following procedures and Figure 4-32.

1. Remove the following 4 seals on the display module in that order:
   - Two black seals on the bottom
   - Two black seals on the top

2. Remove the following 4 screws on the display module, in that order:
   - Two M2.5x7 white flat head screws on the top
   - Two M2.5x7 white flat head screws on bottom

3. Lift up the display mask.

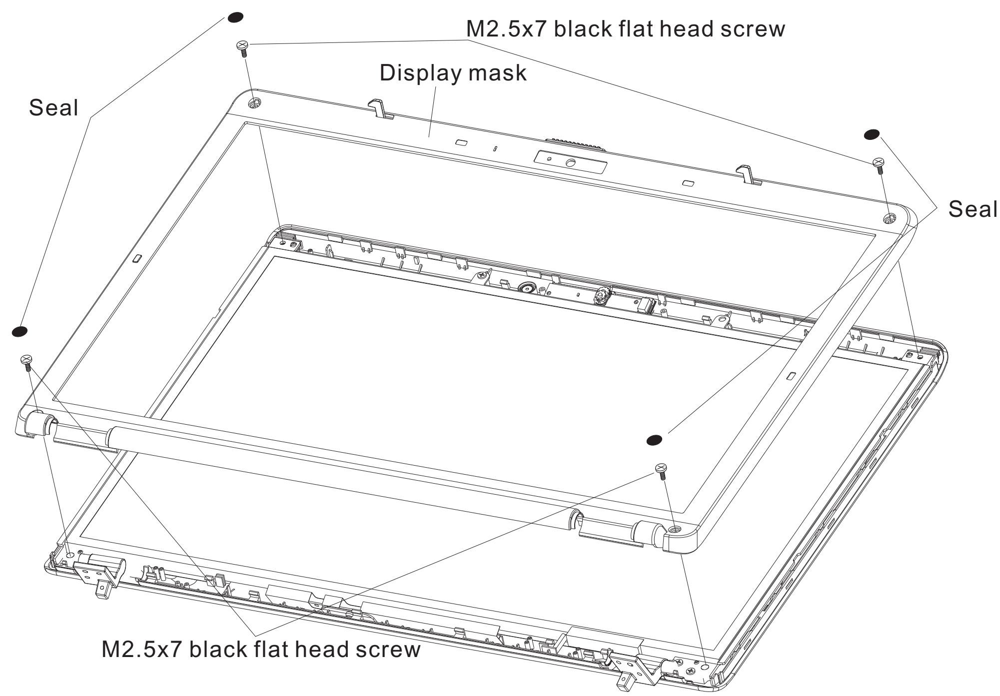


Figure 4-32 Removing the display mask

Installing the Display Mask

Install the display mask according to the following procedures and Figure 4-32.

1. Seat the display mask in the correct position.

2. Secure the display mask with the following 4 screws, in that order:
   - Two M2.5x7 black flat head screws on the top
   - Two M2.5x7 black flat head screws on bottom

1. Secure the following 4 seals to cover the screws, in that order:
   - Two black seals on the bottom
   - Two black seals on the top

4.15 LCD Modules

NOTE: ICs are fragile. Use extreme care not to apply pressure to the ICs along the edges of the LCD module.

NOTE: Dispose of used LCD panels (fluorescent (FL) tubes) as required by local ordinances or regulations.

NOTE: The LCD/FL cable must be carefully peeled away before disconnecting it from the module.

Removing the LCD module

Remove the LCD module according to the following procedures and Figures 4-33, 4-34.

1. Release two M2.5x5 black flat head screws on each side securing the LCD bracket.
2. Carefully tilt the LCD module toward you.
3. Release two M2x3 black flat head screws on each securing the LCD bracket.
4. Remove the LCD brackets.
5. Turn the LCD upside down. Be sure to place it on a cushioned surface such as a foam pad.

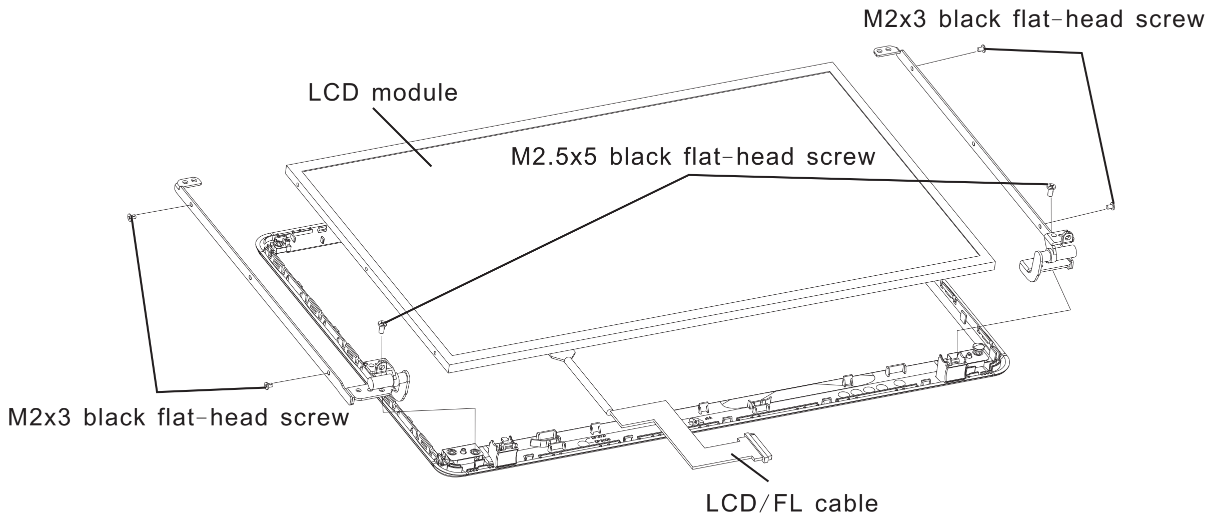


Figure 4-33 Removing the LCD module and screws

6. Remove the tape and LCD/FL cable connector. Then disconnect the LCD/FL cable.

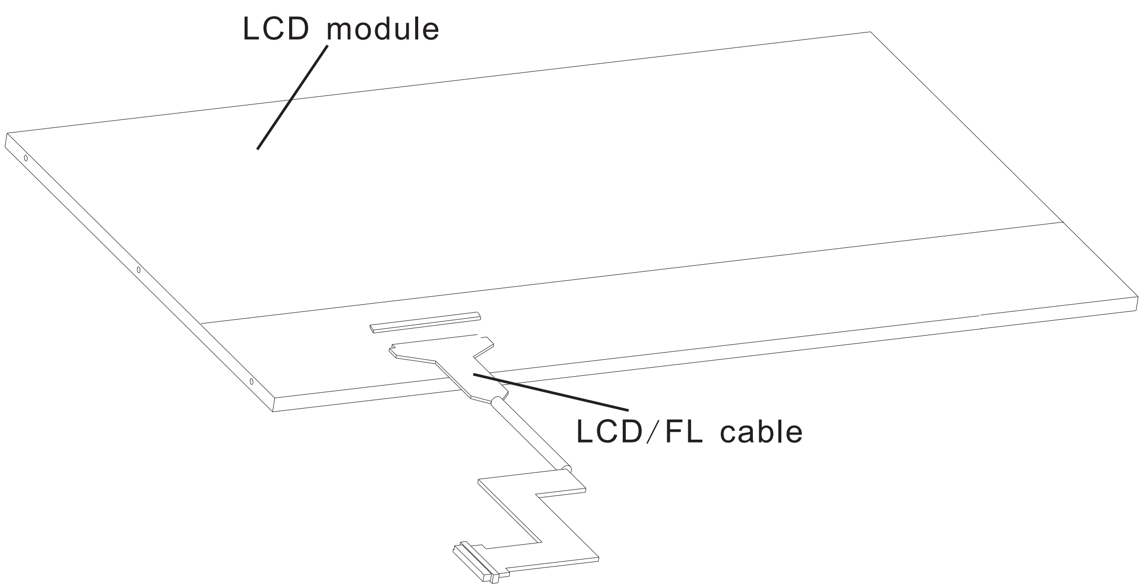


Figure 4-34 Removing the LCD module cable

Installing the LCD Module

NOTE: LCD/FL cable must be carefully peeled away before disconnecting it from the module.

Install the LCD module according to the following procedures and Figures 4-33, 4-34.

1. Turn the LCD upside down.
2. Connect the LCD/FL cable to the LCD module connector.
3. Turn the LCD right side up.
4. Place the LCD bracket in the correct position and secure it with two M2x3 black flat head screws on each side.
5. Please the LCD module in the correct position and secure it with two M2.5x5 black flat heat screws on each side.

CAUTION: When installing the LCD module, please follow below instruction:
When plug in LCD/FL cable into LCD module connector, need to plug horizontally. For Sharp panel, if LCD/FL cable connector is not plugged horizontally, it may be damaged.

4.16 CCD Board and MIC

Removing the CCD Board and MIC

Remove the FL inverter board according to the following procedures and Figure 4-35.

1. Remove the CCD module with CCD cable from display rear cover.
2. Disconnect the CCD cable from the CCD module connector.

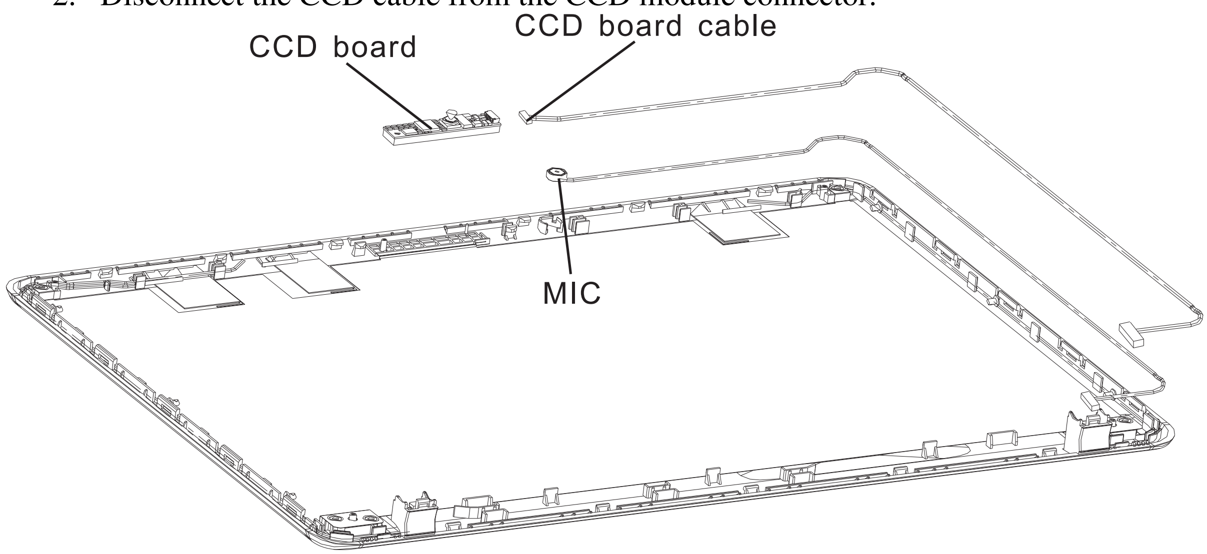


Figure 4-35 Removing the CCD board and MIC

3. Lift the MIC from the display rear cover.

Installing the CCD Board and MIC

Install the FL inverter board according to the following procedures and Figure 4-35.

1. Connect the CCD module cable to CCD module connector.

3. Seat the CCD module, MIC in the correct position.

4.17 Speakers, Switch board and button board

Removing the Speakers, Switch board and Touch pad board

Remove the Speakers, Switch board and Touch pad board according to the following procedures and Figure 4-36 and 4-37.

1. Release three M2x3 black flat head screws securing the switch board.
2. Remove the switch board
3. Disconnect the switch board flat cables from CN9401 on the switch board.
4. Release one M2x3 black flat head screw and one M2x2 white flat head screw securing the left speaker.
5. Release two M2x3 black flat head screws securing the right speaker.
6. Remove the left and right speakers..
7. Disconnect the button board flat cable from CN9302 on the button board.
8. Disconnect the touch pad flat cable from CN9303 on the button board and touch pad board.
9. Release four M2.5X3.5 white flat head screws securing the touch pad bracket.
10. Remove the touch pad bracket.

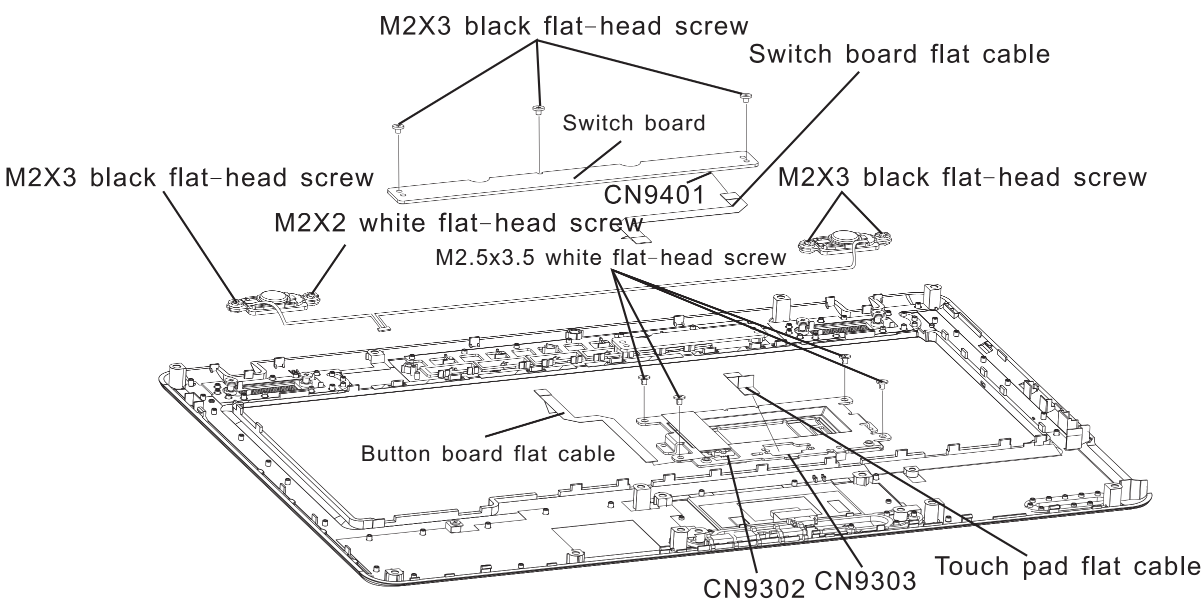


Figure 4-36 Removing the speakers

11. Release two M2x3 black flat head screws securing the button board.

12. Remove the button board.

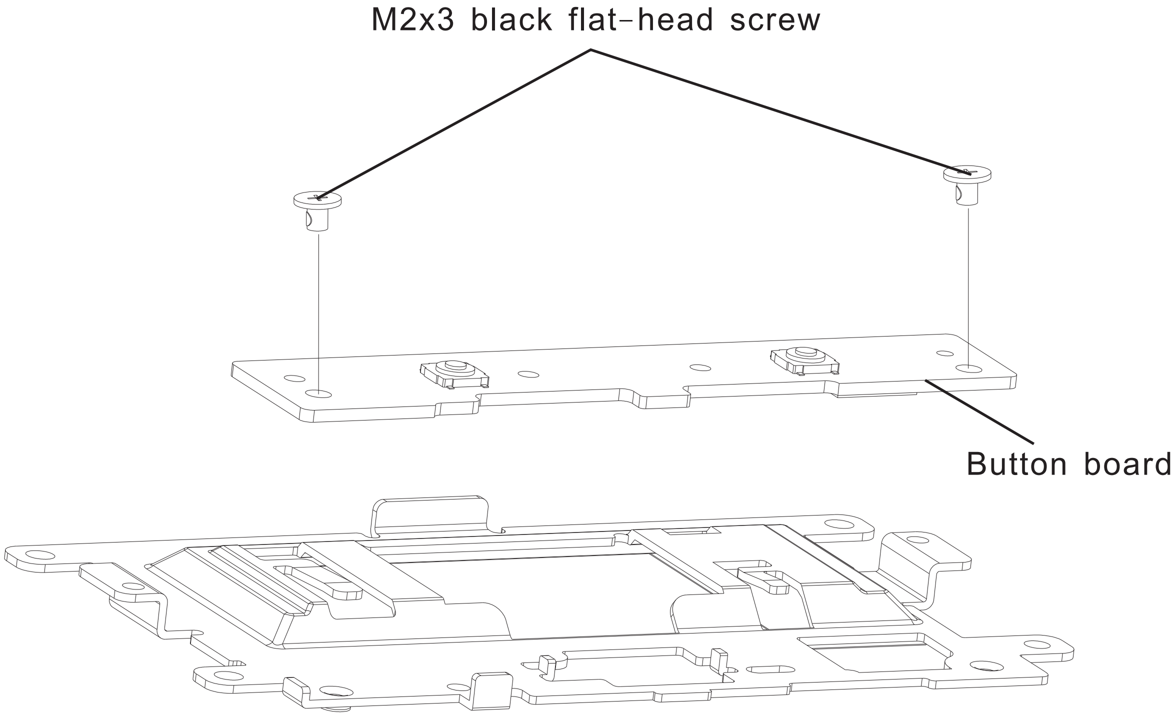


Figure 4-37 Removing the button board

Installing the Speakers

Install the speakers according to the following procedures and Figure 4-36 and 4-37.

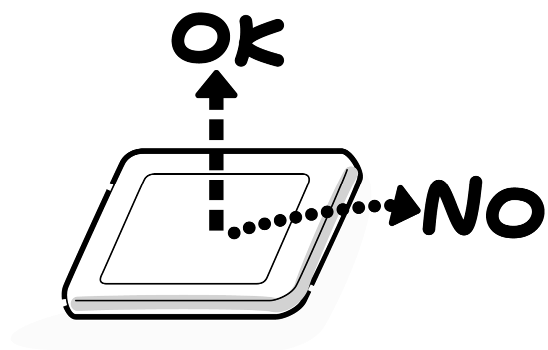
1. Seat the left and right speaker in the correct position.
2. Route the speaker cable in the wire guide.
3. Secure the left speaker with one M2x3 black flat head screw and one M2x2 white flat head screw.
4. Secure the right speaker with two M2x3 black flat head screws.
5. Seat the button board in the correct position.
6. Secure the button board with two M2x3 black flat head screws.
7. Seat the touch pad bracket in the correct position.
8. Secure the touch pad bracket with four M2.5X3.5 white flat head screws.
9. Connect the button flat cable to button board connector.
10. Connect the touch pad flat cable to button board connector and touch pad board connector.
11. Seat switch board in the correct position.
12. Secure the switch board with three M2x3 black flat head screws.

Appendix A Handling the LCD Module

Precautions for handling the LCD module

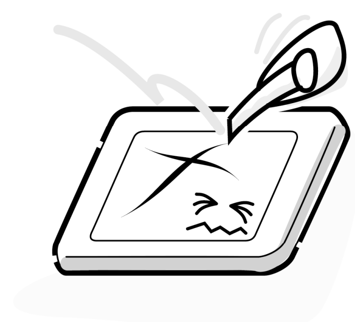
The LCD module can be easily damaged during assembly or disassembly. Observe the following precautions when handling the LCD module:

1. When installing the LCD module in the LCD cover, be sure to seat it so that it is properly aligned and maximum visibility of the display is maintained.



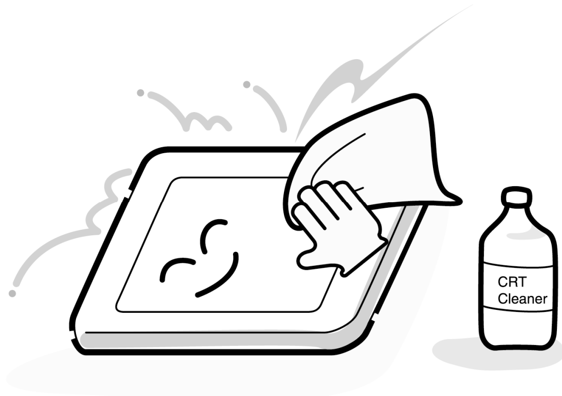
2. Be careful to align the four holes at the right side and left side of the LCD module with the corresponding holes in the LCD cover before securing the module with four screws. Do not force the module into place, because stress can affect its performance. Also, the panel's polarized surface is easily scarred, so be carefully when handling it.





3. If the panel's surface gets dirty, wipe it with cotton or a soft cloth. If it is still dirty, try breathing on the surface to create a light condensate and wipe it again.

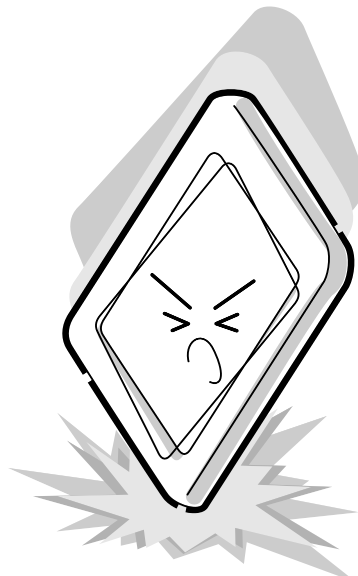
   If the surface is very dirty, we recommend a CRT cleaning agent. Apply the agent to a cloth and then wipe the panel's surface. Do not apply cleanser directly to the panel. Also, never scratch the surface.



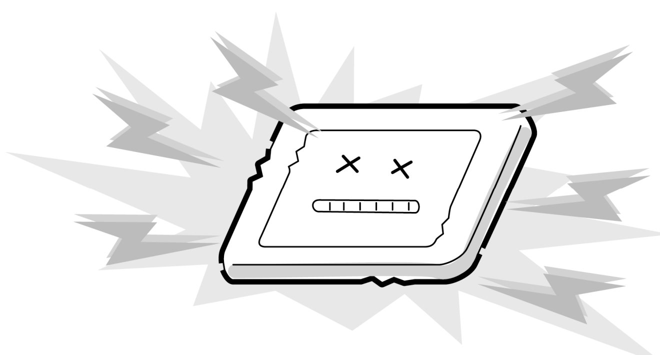
4. If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid.



5. Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.



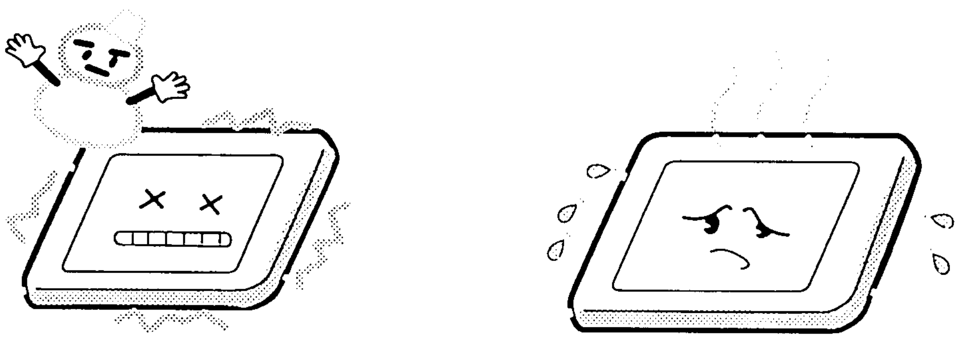
6. CMOS-LSI circuits are used in the module, so guard against damage from electrostatic discharge. Be sure to wear a wrist or ankle ground when handling the module.



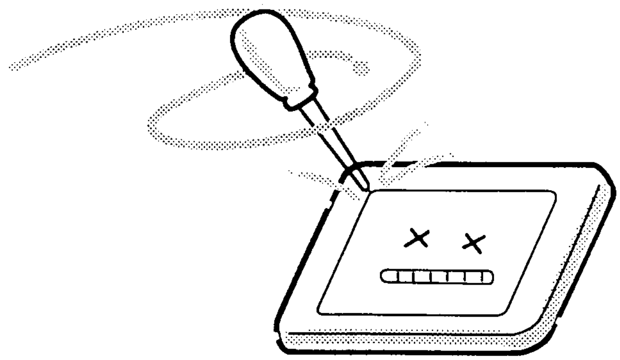
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.



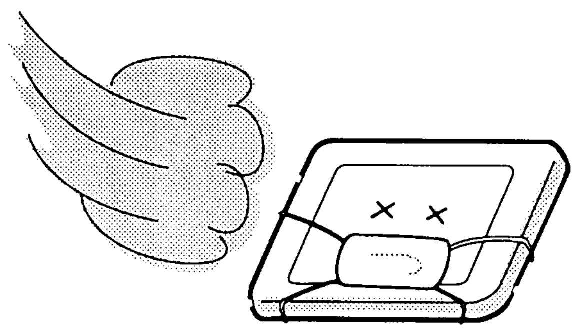
8. Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.



9. Do not disassemble the LCD module. Disassembly can cause malfunctions.



10. If you transport the module, do not use packing material that contains epoxy resin (amine) or silicon glue (alcohol or oxime). These materials can release gas that can damage the panel's polarization.



Appendix B Board Layout

B.1 System Board Front View

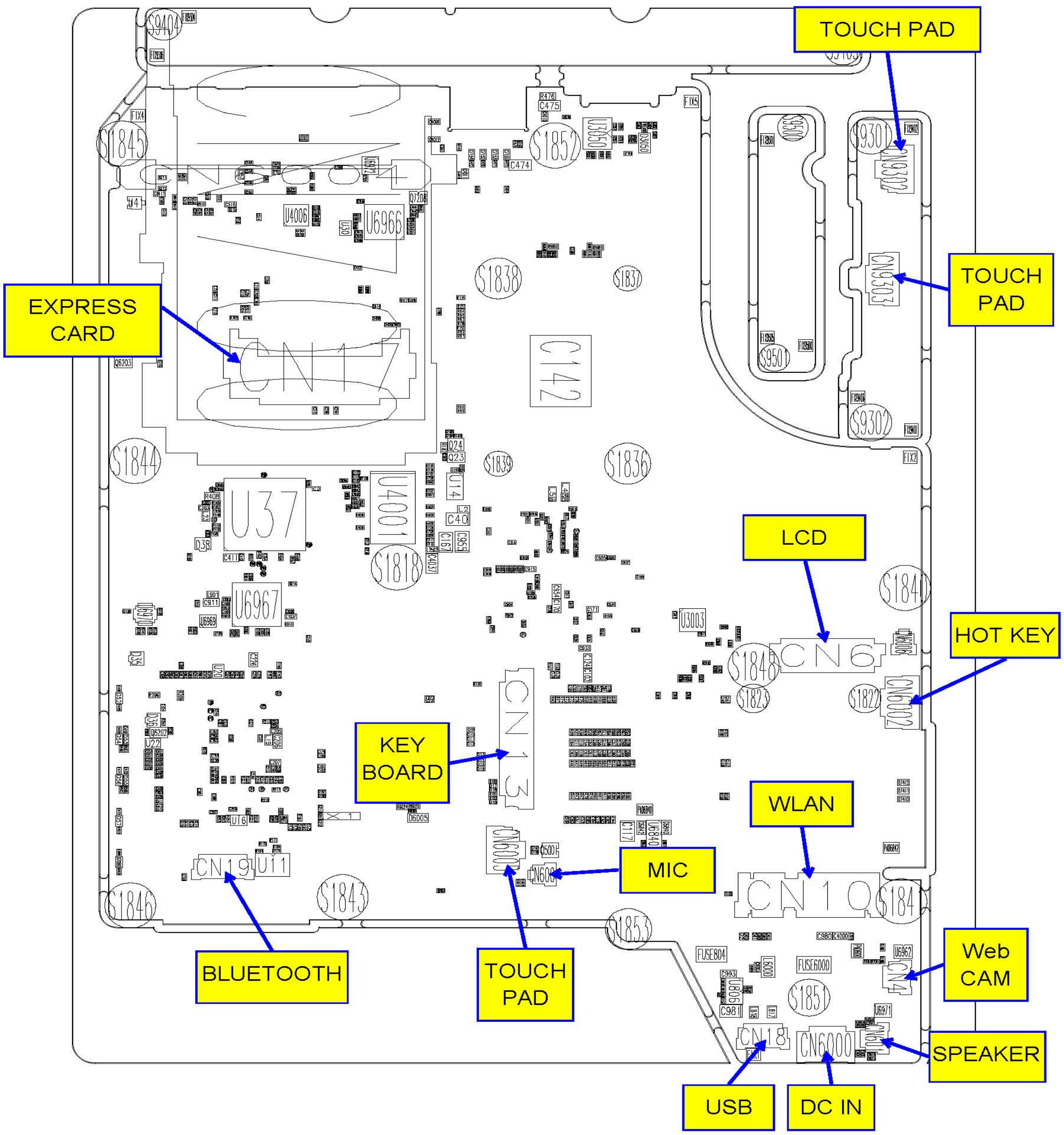


Figure B-1 Board layout (front)

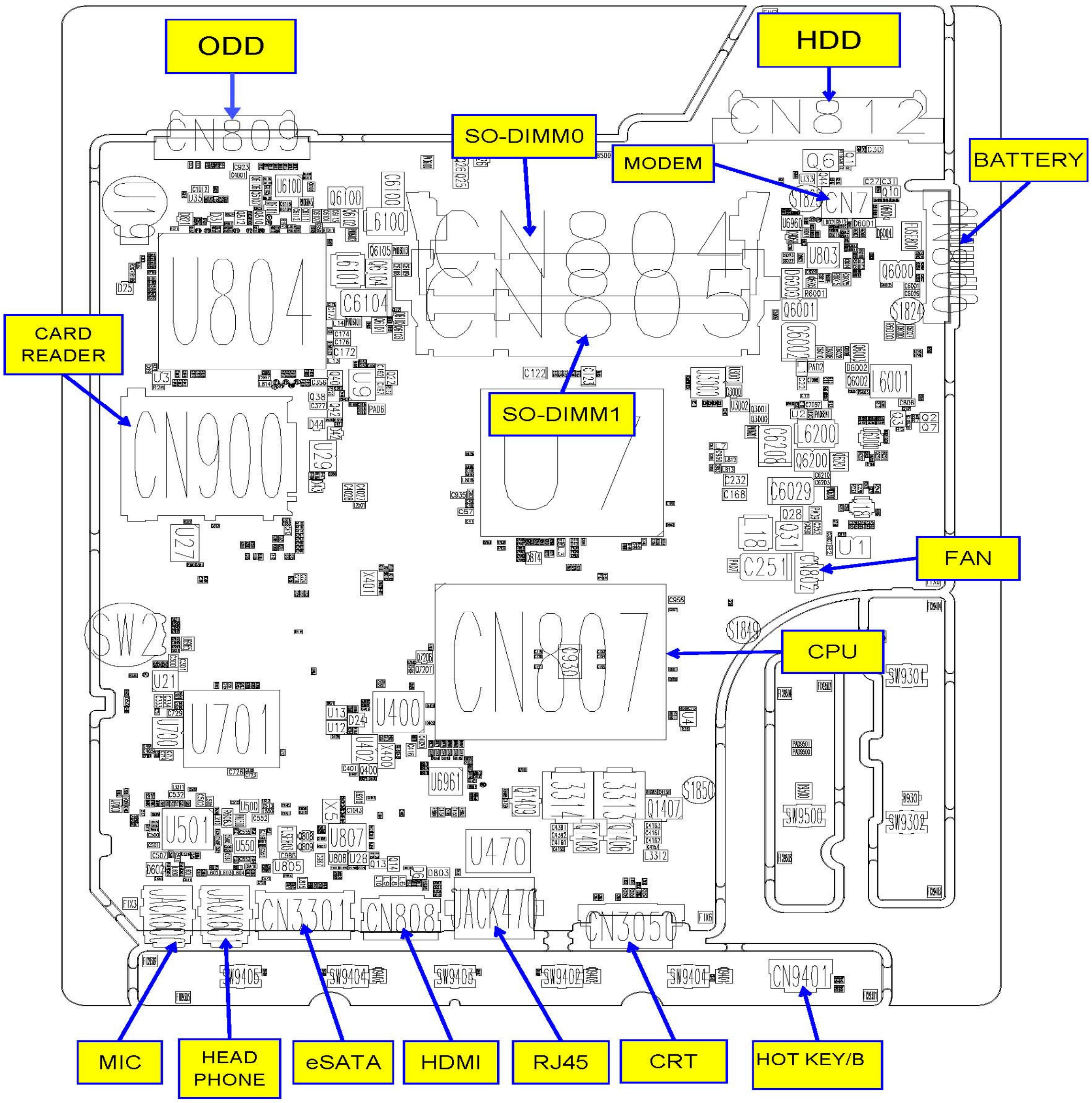


Figure B-2 Board layout (back)

Appendix C C-2

Appendix C Pin Assignments

System Board

C.1 CN4 Camera Connector (5-Pin)

Table C-1 Camera Connector pin assignments (5-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	'/+V5S_CAMERA'	-	2	'/USB_P7-'	I/O
3	'/USB_P7+'	I/O	4	'DGND'	-
5	'DGND'	-	-	-	-

C.2 CN6 LCD Connector (40-Pin)

Table C-2 LCD Connector pin assignments (40-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	DGND'	-	2	/N$5524'	-
3	DGND'	-	4	/N$5524'	-
5	DGND'	-	6	/+V3S'	-
7	/LVDS_TXDL0N'	O	8	/LVDS_TXDL1N'	O
9	/LVDS_TXDL0P'	O	10	/LVDS_TXDL1P'	O
11	/LVDS_TXDL2N'	O	12	/LVDS_TXCLN'	O
13	/LVDS_TXDL2P'	O	14	/LVDS_TXCLP'	O
15	DGND'	-	16	DGND'	-
17	/LVDS_TXDU0N'	O	18	/LVDS_TXDU1N'	O
19	/LVDS_TXDU0P'	O	20	/LVDS_TXDU1P'	O
21	/LVDS_TXDU2N'	O	22	/LVDS_TXCUN'	O
23	/LVDS_TXDU2P'	O	24	/LVDS_TXCUP'	O
25	DGND'	-	26	DGND'	-
27	/LCM_DDCPCLK'	O	28	/LCM_DDCPDATA'	O
29	/+V5S_LCM'	-	30	/+V5S_LCM'	-

31	/+V5S_LCM'	-	32	/+V5S_LCM'	-
33	/+V5S_LCM'	-	34	/+V5S_LCM'	-
35	/INV_PWM_3'	O	36	/N$5529'	-
37	DGND'	-	38	DGND'	-
39	DGND'	-	40	DGND'	-

C.3 CN7 MODEM Connector (12-Pin)

Table C-3 MODEM Connector pin assignments (12-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	DGND'	-	2	/MDC'	I/O
3	/MC97_3S_SDOUT'	I/O	4	-	-
5	DGND'	-	6	/MDC'	I/O
7	/MC97_3S_SYNC'	I/O	8	DGND'	-
9	/N$13669'	-	10	DGND'	-
11	/MC97_3S_RST#'	I/O	12	/MC97_3S_BITCLK'	I/O

C.4 CN10 Mini Card Connector (52-Pin)

Table C-4 Mini Card Connector pin assignments (52-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/PCIE_WAKE#'	I/O-	2	/+V3S'	-
3	/CH_DATA'	I/O	4	DGND'	-
5	/CH_CLK'	O	6	/+V1.5S'	-
7	/CLKREQ_R_WLAN#'	I/O	8	/LPC_3S_FRAME#'	I/O
9	DGND'	-	10	/LPC_3S_AD(3)'	I/O
11	/CLK_R_PCIE_WLAN#'	I/O	12	/LPC_3S_AD(2)'	I/O
13	/CLK_R_PCIE_WLAN'	I/O	14	/LPC_3S_AD(1)'	I/O
15	DGND'	-	16	/LPC_3S_AD(0)'	I/O
17	/BUF_PLT_RST#'	I/O	18	DGND'	-
19	/CLK_R_MINICARD2'	I/O	20	/WXMIT_OFF#'	-
21	DGND'	-	22	/BUF_PLT_RST#'	I/O
23	/PCIE_C_RXN_WLAN'	I/O-	24	/+V3A_WLAN'	-

25	/PCIE_C_RXP_WLAN'	I/O	26	DGND'	-
27	DGND'	-	28	/+V1.5S'	-
29	DGND'	-	30	/ICH_3A_ALERT_CLK'	I/O
31	/PCIE_C_TXN_WLAN'	I/O	32	/ICH_3A_ALERT_DAT'	I/O
33	/PCIE_C_TXP_WLAN'	I/O	34	DGND'	-
35	DGND'	-	36	/USB_P5N'	I/O
37	-	-	38	/USB_P5P'	I/O
39	-	-	40	DGND'	-
41	-	-	42	-	-
43	-	-	44	-	-
45	-	-	46	-	-
47	-	-	48	/+V1.5S'	-
49	-	-	50	DGND'	-
51	/PCI_3S_SERIRQ'	I/O	52	/+V3S'	-

C.5 CN13 Internal Keyboard Connector (34-Pin)

Table C-5 Internal Keyboard Connector pin assignments (34-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/N$9563'	-	2	/N$9561'	-
3	/N$9559'	-	4	/+V3S'	-
5	/SCAN_IN(1)'	O	6	/SCAN_IN(6)'	O
7	/SCAN_IN(5)'	O	8	/SCAN_IN(0)'	O
9	/SCAN_IN(4)'	O	10	/SCAN_IN(3)'	O
11	/SCAN_IN(2)'	O	12	/SCAN_IN(7)'	O
13	/SCAN_OUT(3)'	I	14	/SCAN_OUT(7)'	I
15	/SCAN_OUT(12)'	I	16	/SCAN_OUT(8)'	I
17	/SCAN_OUT(14)'	I	18	/SCAN_OUT(10)'	I
19	/SCAN_OUT(6)'	I	20	/SCAN_OUT(5)'	I
21	/SCAN_OUT(9)'	I	22	/SCAN_OUT(11)'	I
23	/SCAN_OUT(0)'	I	24	/SCAN_OUT(1)'	I
25	/SCAN_OUT(15)'	I	26	/SCAN_OUT(13)'	I
27	/SCAN_OUT(2)'	I	28	/SCAN_OUT(4)'	I
29	/+V3S'	-	30	-	-

31	-	-	32	/N$9566'	-
33	-	-	34	/+V3S'	-

C.6 CN17 Express Card Connector (26-Pin)

Table C-6 Express Cad Connector pin assignments (26-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	DGND'	-	2	/USB_P4N'	I/O
3	/USB_P4P'	I/O	4	/CPUSB#'	I/O
5	-	-	6	-	-
7	/ICH_3A_ALERT_CLK'	I/O	8	/ICH_3A_ALERT_DAT'	I/O
9	/+V1.5_EXP'	-	10	/+V1.5_EXP'	-
11	/PCIE_WAKE#'	I/O	12	/+V3AUX_EXP'	-
13	/PERST#'	I/O	14	/+V3_EXP'	-
15	/+V3_EXP'	-	16	/N$67486'	I/O
17	/CPPE#'	I/O	18	/CLK_R_PCIE_NCARD#'	I/O
19	/CLK_R_PCIE_NCARD'	I/O	20	DGND'	-
21	/PCIE_C_RXN_NCARD'	I/O	22	/PCIE_C_RXP_NCARD'	I/O
23	DGND'	-	24	/PCIE_C_TXN_NCARD'	I/O
25	/PCIE_C_TXP_NCARD'	I/O	26	DGND'	-

C.7 CN18 USB Port#2#3 Connector (8-Pin)

Table C-7 USB Port#2#3 Connector pin assignments (8-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	DGND'	-	2	/USB_L_P2N'	I/O
3	/USB_L_P2P'	I/O	4	/USB_VCC2'	-
5	/USB_VCC2'	-	6	/USB_L_P3N'	I/O
7	/USB_L_P3P'	I/O	8	DGND'	-

C.8 CN19 Blue Tooth Connector (10-Pin)

Table C-8 Blue Tooth Connector pin assignments (10-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/USB_R_P6P'	I/O	2	DGND'	-
3	/USB_R_P6N'	I/O	4	/CH_CLK'	I/O
5	/BTMDL#'	I/O	6	/N$8937'	-
7	/+V3_BT'	-	8	/CH_DATA'	I/O
9	/N$8948'	-	10	DGND'	-

C.9 CN600 Internal Micro Phone Connector (2-Pin)

Table C-9 Internal Micro Phone Connector pin assignments (2-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	ANAGND'	-	2	/MIC_IN'	I

C.10 CN601 Internal Speaker Connector (4-Pin)

Table C-10 Internal Speaker Connector pin assignments (4-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/SPK_OUT_L+'	O	2	/SPK_OUT_L-'	O
3	/SPK_OUT_R-'	O	4	/SPK_OUT_R+'	O

C.11 CN800 Battery Connector (9-Pin)

Table C-11 Battery Connector pin assignments (9-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/N$30808'	-	2	/N$30808'	I/O-
3	/N$71402'	I/O	4	DGND'	O
5	/N$70795'	I/O	6	/N$83390'	O

7	/N$83389'	I/O	8	DGND'	-
9	DGND'	-			

C.12 CN802 FAN Connector (3-Pin)

Table C-12 FAN Connector pin assignments (3-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	VCC	-	2	DGND	-
3	FAN_TACH1'	O	-	-	-

C.13 CN804 DDR2 DIMM0 Socket (200-Pin)

Table C-13 DDR2 DIMM0 Socket pin assignments (200-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/M_VREF'	I/O	2	DGND'	-
3	DGND'	-	4	/MA_DATA(4)'	I/O
5	/MA_DATA(0)'	I/O	6	/MA_DATA(5)'	I/O-
7	/MA_DATA(1)'	I/O	8	DGND'	-
9	DGND'	-	10	/MA_DM(0)'	I/O
11	/MA_DQS#(0)'	I/O	12	DGND'	-
13	/MA_DQS(0)'	I/O	14	/MA_DATA(6)'	I/O
15	DGND'	-	16	/MA_DATA(7)'	I/O
17	/MA_DATA(2)'	I/O	18	DGND'	-
19	/MA_DATA(3)'	I/O	20	/MA_DATA(12)'	I/O
21	DGND'	-	22	/MA_DATA(13)'	I/O
23	/MA_DATA(8)'	I/O	24	DGND'	-
25	/MA_DATA(9)'	I/O	26	/MA_DM(1)'	O
27	DGND'	-	28	DGND'	-
29	/MA_DQS#(1)'	I/O	30	/MA_CLK_DDR1'	I/O
31	/MA_DQS(1)'	I/O	32	/MA_CLK_DDR1#'	I/O
33	DGND'	-	34	DGND'	-
35	/MA_DATA(10)'	I/O	36	/MA_DATA(14)'	I/O

37	/MA_DATA(11)'	I/O	38	/MA_DATA(15)'	I/O
39	DGND'	-	40	DGND'	-
41	DGND'	-	42	DGND'	-
43	/MA_DATA(16)'	I/O	44	/MA_DATA(20)'	I/O
45	/MA_DATA(17)'	I/O	46	/MA_DATA(21)'	I/O
47	DGND'	-	48	DGND'	O
49	/MA_DQS#(2)'	I/O	50	/PM_EXTTS#0'	I/O
51	/MA_DQS(2)'	I/O	52	/MA_DM(2)'	I/O
53	DGND'	-	54	DGND'	-
55	/MA_DATA(18)'	I/O	56	/MA_DATA(22)'	I/O
57	/MA_DATA(19)'	I/O	58	/MA_DATA(23)'	I/O
59	DGND'	-	60	DGND'	-
61	/MA_DATA(24)'	I/O	62	/MA_DATA(28)'	I/O
63	/MA_DATA(25)'	I/O	64	/MA_DATA(29)'	I/O
65	DGND'	-	66	DGND'	I/O
67	/MA_DM(3)'	I/O	68	/MA_DQS#(3)'	I/O
69	-	-	70	/MA_DQS(3)'	I/O
71	DGND'	-	72	DGND'	-
73	/MA_DATA(26)'	I/O	74	/MA_DATA(30)'	I/O
75	/MA_DATA(27)'	I/O	76	/MA_DATA(31)'	I/O
77	DGND'	-	78	DGND'	-
79	/MA_CKE0'	O	80	/MA_CKE1'	I
81	/+V1.8'	-	82	/+V1.8'	-
83	/MA_BA2'	I/O	84	/MA_A(14)'	-
85	/+V1.8'	-	86	/+V1.8'	-
87	/MA_DATA(26)'	I/O	88	DGND'	-
89	/MA_A(12)'	I/O	90	/MA_A(11)'	I/O
91	/MA_A(9)'	I/O	92	/MA_A(7)'	I/O
93	/MA_A(8)'	I/O	94	/MA_A(6)'	I/O
95	/+V1.8'	-	96	/+V1.8'	-
97	/MA_A(5)'	I/O	98	/MA_A(4)'	I/O
99	/MA_A(3)'	I/O	100	/MA_A(2)'	I/O
101	/MA_A(1)'	I/O	102	/MA_A(0)'	I/O
103	/+V1.8'	-	104	/+V1.8'	-
105	/MA_A(10)'	I/O	106	/MA_BA1'	I/O

107	/MA_BA0'	I/O	108	/MA_RAS#'	I/O
109	/MA_WE#'	I/O	110	/MA_CS0#'	I/O
111	/+V1.8'	-	112	/+V1.8'	-
113	/MA_CAS#'	I/O	114	/MA_ODT0'	I/O
115	/MA_CS1#'	I/O	116	/MA_A(13)'	I/O
117	/+V1.8'	-	118	/+V1.8'	-
119	/MA_ODT1'	I/O	120	-	-
121	DGND'	-	122	DGND'	-
123	/MA_DATA(32)'	I/O	124	/MA_DATA(36)'	I/O
125	/MA_DATA(33)'	I/O	126	/MA_DATA(37)'	I/O
127	DGND'	-	128	DGND'	-
129	/MA_DQS#(4)'	O	130	/MA_DM(4)'	I/O
131	/MA_DQS(4)'	I/O	132	DGND'	-
133	DGND'	-	134	/MA_DATA(38)'	I/O
135	/MA_DATA(34)'	I/O	136	/MA_DATA(39)'	I/O
137	/MA_DATA(35)'	I/O	138	DGND'	-
139	DGND'	-	140	/MA_DATA(44)'	I/O
141	/MA_DATA(40)'	I/O	142	/MA_DATA(45)'	I/O
143	/MA_DATA(41)'	I/O	144	DGND'	-
145	DGND'	-	146	/MA_DQS#(5)'	I/O
147	/MA_DM(5)'	I/O	148	/MA_DQS(5)'	I/O
149	DGND'	-	150	DGND'	-
151	/MA_DATA(42)'	I/O	152	/MA_DATA(46)'	I/O
153	/MA_DATA(43)'	I/O	154	/MA_DATA(47)'	I/O
155	DGND'	-	156	DGND'	-
157	/MA_DATA(48)'	I/O-	158	/MA_DATA(52)'	I/O
159	/MA_DATA(49)'	I/O	160	/MA_DATA(53)'	I/O
161	DGND'	-	162	DGND'	-
163	-	-	164	/MA_CLK_DDR2'	O
165	DGND'	O	166	/MA_CLK_DDR2#'	I/O
167	/MA_DQS#(6)'	I/O	168	DGND'	-
169	/MA_DQS(6)'	O	170	/MA_DM(6)'	I/O
171	DGND'	-	172	DGND'	-
173	/MA_DATA(50)'	I/O	174	/MA_DATA(54)'	I/O
175	/MA_DATA(51)'	I/O	176	/MA_DATA(55)'	I/O

177	DGND'	-	178	DGND'	-
179	/MA_DATA(56)'	I/O	180	/MA_DATA(60)'	I/O
181	/MA_DATA(57)'	I/O	182	/MA_DATA(61)'	I/O
183	DGND'	-	184	DGND'	-
185	/MA_DM(7)'	I/O	186	/MA_DQS#(7)'	I/O
187	DGND'	-	188	/MA_DQS(7)'	I/O
189	/MA_DATA(58)'	I/O	190	DGND'	-
191	/MA_DATA(59)'	I/O	192	/MA_DATA(62)'	I/O
193	DGND'	-	194	/MA_DATA(63)'	I/O
195	/ICH_3S_SMDATA'	I/O	196	DGND'	-
197	/ICH_3S_SMCLK'	I/O	198	/N$4112'	-
199	/+V3S'	-	200	/N$4114'	-

C.14 CN805 DDR2 DIMM1 Socket (200-Pin)

Table C-14 DDR2 DIMM1 Socket pin assignments (200-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/M_VREF'	I/O	2	DGND'	-
3	DGND'	-	4	/MB_DATA(4)'	I/O
5	/MB_DATA(0)'	I/O	6	/MB_DATA(5)'	I/O-
7	/MB_DATA(1)'	I/O	8	DGND'	-
9	DGND'	-	10	/MB_DM(0)'	I/O
11	/MB_DQS#(0)'	I/O	12	DGND'	-
13	/MB_DQS(0)'	I/O	14	/MB_DATA(6)'	I/O
15	DGND'	-	16	/MB_DATA(7)'	I/O
17	/MB_DATA(2)'	I/O	18	DGND'	-
19	/MB_DATA(3)'	I/O	20	/MB_DATA(12)'	I/O
21	DGND'	-	22	/MB_DATA(13)'	I/O
23	/MB_DATA(8)'	I/O	24	DGND'	-
25	/MB_DATA(9)'	I/O	26	/MB_DM(1)'	O
27	DGND'	-	28	DGND'	-
29	/MB_DQS#(1)'	I/O	30	/MB_CLK_DDR1'	I/O
31	/MB_DQS(1)'	I/O	32	/MB_CLK_DDR1#'	I/O
33	DGND'	-	34	DGND'	-

35	/MB_DATA(10)'	I/O	36	/MB_DATA(14)'	I/O
37	/MB_DATA(11)'	I/O	38	/MB_DATA(15)'	I/O
39	DGND'	-	40	DGND'	-
41	DGND'	-	42	DGND'	-
43	/MB_DATA(16)'	I/O	44	/MB_DATA(20)'	I/O
45	/MB_DATA(17)'	I/O	46	/MB_DATA(21)'	I/O
47	DGND'	-	48	DGND'	O
49	/MB_DQS#(2)'	I/O	50	/PM_EXTTS#0'	I/O
51	/MB_DQS(2)'	I/O	52	/MB_DM(2)'	I/O
53	DGND'	-	54	DGND'	-
55	/MB_DATA(18)'	I/O	56	/MB_DATA(22)'	I/O
57	/MB_DATA(19)'	I/O	58	/MB_DATA(23)'	I/O
59	DGND'	-	60	DGND'	-
61	/MB_DATA(24)'	I/O	62	/MB_DATA(28)'	I/O
63	/MB_DATA(25)'	I/O	64	/MB_DATA(29)'	I/O
65	DGND'	-	66	DGND'	I/O
67	/MB_DM(3)'	I/O	68	/MB_DQS#(3)'	I/O
69	-	-	70	/MB_DQS(3)'	I/O
71	DGND'	-	72	DGND'	-
73	/MB_DATA(26)'	I/O	74	/MB_DATA(30)'	I/O
75	/MB_DATA(27)'	I/O	76	/MB_DATA(31)'	I/O
77	DGND'	-	78	DGND'	-
79	/MB_CKE0'	O	80	/MB_CKE1'	I
81	/+V1.8'	-	82	/+V1.8'	-
83	/MB_BA2'	I/O	84	/MB_A(14)'	-
85	/+V1.8'	-	86	/+V1.8'	-
87	/MB_DATA(26)'	I/O	88	DGND'	-
89	/MB_A(12)'	I/O	90	/MB_A(11)'	I/O
91	/MB_A(9)'	I/O	92	/MB_A(7)'	I/O
93	/MB_A(8)'	I/O	94	/MB_A(6)'	I/O
95	/+V1.8'	-	96	/+V1.8'	-
97	/MB_A(5)'	I/O	98	/MB_A(4)'	I/O
99	/MB_A(3)'	I/O	100	/MB_A(2)'	I/O
101	/MB_A(1)'	I/O	102	/MB_A(0)'	I/O
103	/+V1.8'	-	104	/+V1.8'	-

105	/MB_A(10)'	I/O	106	/MB_BA1'	I/O
107	/MB_BA0'	I/O	108	/MB_RAS#'	I/O
109	/MB_WE#'	I/O	110	/MB_CS0#'	I/O
111	/+V1.8'	-	112	/+V1.8'	-
113	/MB_CAS#'	I/O	114	/MB_ODT0'	I/O
115	/MB_CS1#'	I/O	116	/MB_A(13)'	I/O
117	/+V1.8'	-	118	/+V1.8'	-
119	/MB_ODT1'	I/O	120	-	-
121	DGND'	-	122	DGND'	-
123	/MB_DATA(32)'	I/O	124	/MB_DATA(36)'	I/O
125	/MB_DATA(33)'	I/O	126	/MB_DATA(37)'	I/O
127	DGND'	-	128	DGND'	-
129	/MB_DQS#(4)'	O	130	/MB_DM(4)'	I/O
131	/MB_DQS(4)'	I/O	132	DGND'	-
133	DGND'	-	134	/MB_DATA(38)'	I/O
135	/MB_DATA(34)'	I/O	136	/MB_DATA(39)'	I/O
137	/MB_DATA(35)'	I/O	138	DGND'	-
139	DGND'	-	140	/MB_DATA(44)'	I/O
141	/MB_DATA(40)'	I/O	142	/MB_DATA(45)'	I/O
143	/MB_DATA(41)'	I/O	144	DGND'	-
145	DGND'	-	146	/MB_DQS#(5)'	I/O
147	/MB_DM(5)'	I/O	148	/MB_DQS(5)'	I/O
149	DGND'	-	150	DGND'	-
151	/MB_DATA(42)'	I/O	152	/MB_DATA(46)'	I/O
153	/MB_DATA(43)'	I/O	154	/MB_DATA(47)'	I/O
155	DGND'	-	156	DGND'	-
157	/MB_DATA(48)'	I/O-	158	/MB_DATA(52)'	I/O
159	/MB_DATA(49)'	I/O	160	/MB_DATA(53)'	I/O
161	DGND'	-	162	DGND'	-
163	-	-	164	/MB_CLK_DDR2'	O
165	DGND'	O	166	/MB_CLK_DDR2#'	I/O
167	/MB_DQS#(6)'	I/O	168	DGND'	-
169	/MB_DQS(6)'	O	170	/MB_DM(6)'	I/O
171	DGND'	-	172	DGND'	-
173	/MB_DATA(50)'	I/O	174	/MB_DATA(54)'	I/O

175	/MB_DATA(51)'	I/O	176	/MB_DATA(55)'	I/O
177	DGND'	-	178	DGND'	-
179	/MB_DATA(56)'	I/O	180	/MB_DATA(60)'	I/O
181	/MB_DATA(57)'	I/O	182	/MB_DATA(61)'	I/O
183	DGND'	-	184	DGND'	-
185	/MB_DM(7)'	I/O	186	/MB_DQS#(7)'	I/O
187	DGND'	-	188	/MB_DQS(7)'	I/O
189	/MB_DATA(58)'	I/O	190	DGND'	-
191	/MB_DATA(59)'	I/O	192	/MB_DATA(62)'	I/O
193	DGND'	-	194	/MB_DATA(63)'	I/O
195	/ICH_3S_SMDATA'	I/O	196	DGND'	-
197	/ICH_3S_SMCLK'	I/O	198	/N$4112'	-
199	/+V3S'	-	200	/N$4114'	-

C.15 CN808 HDMI Connector (19-Pin)

Table C-15 HDMI Connector pin assignments (19-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/HDMI_L_TX2P'	I/O	2	DGND'	-
3	/HDMI_L_TX2N'	I/O	4	/HDMI_L_TX1P'	I/O
5	DGND'	-	6	/HDMI_L_TX1N'	I/O
7	/HDMI_L_TX0P'	I/O	8	DGND'	-
9	/HDMI_L_TX0N'	I/O	10	/HDMI_L_TXCP'	I/O
11	DGND'	-	12	/HDMI_L_TXCN'	I/O
13	/HDMI_CEC'	I/O	14	-	-
15	/HDMI_DDCCLK'	O	16	/HDMI_DDCDATA'	I/O
17	DGND'	-	18	/N$11126'	-
19	/N$11124'	-	-	-	-

C.16 CN809 ODD Connector (13-Pin)

Table C-16 ODD Connector pin assignments (13-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O

1	DGND	-	2	SATA_C_TXP5'	I/O
3	SATA_C_TXN5	I/O	4	DGND	-
5	SATA_C_RXN5'	I/O	6	SATA_C_RXP5'	I/O
7	DGND	-	8	-	-
9	V5S'	-	10	V5S'	-
11	-	-	12	DGND'	-
13	DGND'	-	14	-	-

C.17 CN812 HDD Connector (22-Pin)

Table C-17 HDD Connector pin assignments (22-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	DGND'	-	2	/SATA_C_TXP0'	I/O
3	/SATA_C_TXN0'	I/O	4	DGND'	-
5	/SATA_RXN0'	I/O	6	/SATA_RXP0'	I/O
7	DGND'	-	8	-	-
9	-	-	10	-	-
11	DGND'	-	12	DGND'	-
13	DGND'	-	14	/+V5S'	-
15	/+V5S'	-	16	/+V5S'	-
17	DGND'	-	18	-	-
19	DGND'	-	20	-	-
21	-	-	22	-	-

C.18 CN900 CARD READER Socket (24-Pin)

Table C-18 CARD READER Socket pin assignments (24-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/SD_DAT2'	I/O	2	DGND'	-
3	/SD_DAT3'	I/O	4	/+CARD_3V3'	I/O
5	/SD_CLK_MS_CL	I/O	6	/SD_CMD'	I/O
7	/SD_DAT6_MS_D3	I/O	8	/MS_INS#'	I/O

9	DGND'	-	10	/SD_DAT7_MS_D2'	I/O
11	/+CARD_3V3'	I/O	12	/SD_DAT0_MS_D0'	I/O
13	/MS_DATA1'	I/O	14	/SD_CLK_MS_CLK'	I/O
15	/MS_BS'	I/O	16	DGND'	-
17	DGND'	-	18	/SD_DAT0_MS_D0'	I/O
19	/SD_DAT1'	I/O	20	/SD_CD#'	I/O
21	DGND'	-	22	/SD_WP'	I/O
23	DGND'	-	24	DGND'	-

C.19 CN3050 CRT Connector (15-Pin)

Table C-19 CRT Connector pin assignments (15-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/CRTR_R'	O	2	/CRTG_R'	O
3	/CRTB_R'	O	5	DGND'	-
7	DGND'	-	8	DGND'	-
9	/N$1301063'	O	10	DGND'	-
11	/-	-	12	/N$1301052'	O
13	/HSYNC'	I/O	14	/VSYNC'	I/O
15	/N$1301055'	I/O	G1	DGND'	-

C.20 CN3301 USB_eSATA Port Connector (11-Pin)

Table C-20 USB_eSATA Port Connector pin assignments (11-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/+USB_VCC1'	-	2	/USB_L_P0N'	I/O
3	/USB_L_P0P'	I/O	4	DGND'	-
5	DGND'	-	6	/SATA_IC_C_TXP_ESATA'	I/O
7	/SATA_IC_C_TXN_ESATA'	I/O	8	DGND'	-
9	/SATA_RXN_ESATA'	I/O	10	/SATA_RXP_ESATA'	I/O
11	DGND'	-	G1	DGND'	-

C.21 CN6000 DC-IN Connector (4-Pin)

Table C-21 DC-IN Connector pin assignments (4-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/N$30560'	I	2	/N$30560'	I
3	DGND'	-	4	DGND'	-

C.22 CN6002 Hot Key/B Connector (12-Pin)

Table C-22 Hot Key/B Connector pin assignments (12-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	SB_DGUN'	-	2	SB_DGUN'	-
3	/MACHINE_ID1_DBSW'	I/O	4	/MACHINE_ID0_DBSW'	-
5	SB_DGUN'	-	6	SB_DGUN'	I/O
7	/N$1337707'	-	8	/N$1337708'	-
9	/N$1337709'	-	10	/N$1337710'	-
11	/N$1337704'	-	12	/HK_PWR_SWIN#_3'	I/O

C.23 CN6005 Touch Pad Connector (4-Pin)

Table C-23 Touch Pad Connector pin assignments (4-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/+V5S'	-	2	/IM_CLK_5'	I/O
3	/IM_DAT_5'	I/O	4	DGND'	I/O

C.24 CN9302 Touch Pad board Connector (4-Pin)

Table C-24 Touch Pad board Connector pin assignments (4-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/+TP_5S'	-	2	/TP_IM_CLK_5'	I/O

3	/TP_IM_DAT_5'	I/O	4	GND_TP'	I/O

C.25 CN9303 Touch Pad Connector (12-Pin)

Table C-25 Touch Pad Connector pin assignments (12-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/+TP_5S'	-	2	/+TP_5S'	I/O
3	/TP_IM_DAT_5'	I/O	4	/TP_IM_CLK_5'	I/O
5	GND_TP'	-	6	GND_TP'	-
10	/BUT_LEFT'	I/O	11	/BUT_RIGHT'	I/O

C.26 CN9401 Hot Key/B Connector (12-Pin)

Table C-26 Hot Key /B Connector pin assignments (12-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	DGND'	-	2	/SCAN_OUT(4)'	O
3	/SCAN_IN(0)'	I	4	/SCAN_IN(7)'	I
5	/SCAN_IN(3)'	I	6	/SCAN_IN(4)'	I
7	/SCAN_IN(5)'	I	8	/SCAN_IN(1)'	I
9	/MACHINE_ID0_DB'	I/O	10	/MACHINE_ID1_DB'	I/O
11	DGND'	-	12	DGND'	-
G1	DGND'	-	G2	DGND'	-

C.27 JACK470 RJ45 Connector (12-Pin)

Table C-27 RJ45 Connector pin assignments (12-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/LAN_TDP'	I/O	2	/LAN_TDN'	I/O
3	/LAN_RDP'	I/O	4	/LAN_45'	I/O
5	/LAN_45'	I/O	6	/LAN_RDN'	I/O
7	/LAN_78'	I/O	8	/LAN_78'	I/O
A1	/N$1286869'	I/O	A2	/N$1286871'	I/O

B1	/N$1286878'	I	B2	/N$1286879'	I

C.28 JACK600 Head Phone Connector (6-Pin)

Table C-28 Head Phone Connector pin assignments (6-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	ANAGND'	O	2	/N$1347562'	O
3	/N$1258863'	O	4	/HPS'	-
5	ANAGND'	-	6	ANAGND'	-

C.29 JACK601 MICRO Phone Connector (6-Pin)

Table C-29 MICRO Phone Connector pin assignments (6-Pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	/N$10326'	-	2	/N$10321'	-
3	/N$10319'	-	4	/MICS'	I/O
5	ANAGND'	-	6	-	-

Appendix D Keyboard Scan/Character Codes

Table D-1 Scan codes (set 1 and set 2) (1/4)

Cap No.	Keytop	Code set 1		Code set 2			Note
		Make	Break	Make	Break		
01	‘ ~	29	A9	0E	F0	0E	
02	1 !	02	82	16	F0	16	
03	2 @	03	83	1E	F0	1E	
04	3 #	04	84	26	F0	26	
05	4 $	05	85	25	F0	25	
06	5 %	06	86	2E	F0	2E	
07	6 ^	07	87	36	F0	36	
08	7 &	08	88	3D	F0	3D	*2
09	8 *	09	89	3E	F0	3E	*2
10	9 (	0A	8A	46	F0	46	*2
11	0)	0B	8B	45	F0	45	*2
12	- _	0C	8C	4E	F0	4E	
13	= +	0D	8D	55	F0	55	
14				7D	F0	7D	
15	BkSp	0E	8E	66	F0	66	
16	Tab	0F	8F	0D	F0	0D	
17	Q	10	90	15	F0	15	
18	W	11	91	1D	F0	1D	
19	E	12	92	24	F0	24	
20	R	13	93	2D	F0	2D	
21	T	14	94	2C	F0	2C	
22	Y	15	95	35	F0	35	
23	U	16	96	3C	F0	3C	*2
24	I	17	97	43	F0	43	*2
25	O	18	98	44	F0	44	*2
26	P	19	99	4D	F0	4D	*2
27	[{	1A	9A	54	F0	54	
28	] }	1B	9B	5B	F0	5B	

Table D-1 Scan codes (set 1 and set 2) (2/4)

Cap No.	Keytop	Code set 1		Code set 2			Note
		Make	Break	Make	Break		
29	\ |	2B	AB	5D	F0	5D	*5
30	Caps Lock	3A	BA	58	F0	58	
31	A	1E	9E	1C	F0	1C	
32	S	1F	9F	1B	F0	1B	
33	D	20	A0	23	F0	23	
34	F	21	A1	2B	F0	2B	
35	G	22	A2	34	F0	34	
36	H	23	A3	33	F0	33	
37	J	24	A4	3B	F0	3B	*2
38	K	25	A5	42	F0	42	*2
39	L	26	A6	4B	F0	4B	*2
40	; :	27	A7	4C	F0	4C	*2
41	‘ “	28	A8	52	F0	52	
43	Enter	1C	9C	5A	F0	5A	*3
44	Shift (L)	2A	AA	12	F0	12	
45	No.102 key	56	D6	61	F0	61	
46	Z	2C	AC	1A	F0	1A	
47	X	2D	AD	22	F0	22	
48	C	2E	AE	21	F0	21	
49	V	2F	AF	2A	F0	2A	
50	B	30	B0	32	F0	32	
51	N	31	B1	31	F0	31	
52	M	32	B2	3A	F0	3A	*2
53	, <	33	B3	41	F0	41	*2
54	. >	34	B4	49	F0	49	*2
55	/ ?	35	B5	4A	F0	4A	*2
56	_			73	F0	73	
57	Shift (R)	36	B6	59	F0	59	

Table D-1 Scan codes (set 1 and set 2) (3/4)

Cap No.	Keytop	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break	Note
58	Ctrl	1D	9D	14	F0 14	*3
60	Alt (L)	38	B8	11	F0 11	*3
61	Space	39	B9	29	F0 29	
62	ALT (R)	E0 38	E0 B8	E0 11	E0 F0 11	
75	Ins	E0 52	E0 D2	E0 70	E0 F0 70	*1
76	Del	E0 53	E0 D3	E0 71	E0 F0 71	*1
79	←	E0 4B	E0 CB	E0 6B	E0 F0 6B	*1
80	Home	E0 47	E0 C7	E0 6C	E0 F0 6C	*1
81	End	E0 4F	E0 CF	E0 69	E0 F0 69	*1
83	↑	E0 48	E0 C8	E0 75	E0 F0 75	*1
84	↓	E0 50	E0 D0	E0 72	E0 F0 72	*1
85	PgUp	E0 49	E0 C9	E0 7D	E0 F0 7D	*1
86	PgDn	E0 51	E0 D1	E0 7A	E0 F0 7A	*1
89	→	E0 4D	E0 CD	E0 74	E0 F0 74	*1
110	Esc	01	81	76	F0 76	
112	F1	3B	BB	05	F0 05	
113	F2	3C	BC	06	F0 06	
114	F3	3D	BD	04	F0 04	
115	F4	3E	BE	0C	F0 0C	
116	F5	3F	BF	03	F0 03	
117	F6	40	C0	0B	F0 0B	
118	F7	41	C1	83	F0 83	
119	F8	42	C2	0A	F0 0A	
120	F9	43	C3	01	F0 01	
121	F10	44	C4	09	F0 09	*3

Table D-1 Scan codes (set 1 and set 2) (4/4)

Cap No.	Keytop	Code set 1		Code set 2		Note
		Make	**Break**	**Make**	**Break**	
122	F11	57	D7	78	F0 78	*3
123	F12	58	D8	7	F0 7	*3
124	PrintSc	*6	*6	*6	*6	*6
126	Pause	*7	*7	*7	*7	*7
202	Fn	—	—	—	—	*4
203	Win	E0 5B	E0 DB	E0 1F	E0 F0 1F	
204	App	E0 5D	E0 DD	E0 2F	E0 F0 2F	
205	Kat/Hir			70	F0 70	*8
206	Hen			79	F0 79	*8
207	Muh			7B	F0 7B	*8

Notes:

1. * Scan codes differ by mode.
2. * Scan codes differ by overlay function.
3. * Combination with the **Fn** key makes different codes.
4. * **Fn** key does not generate a code by itself.
5. * This key corresponds to key No. 42 in a 102-key model.
6. * Refer to Table D-6, No. 124 key scan code.
7. * Refer to Table D-7, No. 126 key scan code.
8. * 205~207 are for JAPAN keyboard only

Table D-2 Scan codes with left Shift key

Cap No.	Key top	Code set 1								Code set 2									
		Make				Break				Make					Break				
55	/	E0	AA	E0	35	E0	B5	E0	2A	E0	F0	12	E0	4A	E0	F0	4A	E0	12
75	INS	E0	AA	E0	52	E0	D2	E0	2A	E0	F0	12	E0	70	E0	F0	70	E0	12
76	DEL	E0	AA	E0	53	E0	D3	E0	2A	E0	F0	12	E0	71	E0	F0	71	E0	12
79	←	E0	AA	E0	4B	E0	CB	E0	2A	E0	F0	12	E0	6B	E0	F0	6B	E0	12
80	Home	E0	AA	E0	47	E0	C7	E0	2A	E0	F0	12	E0	6C	E0	F0	6C	E0	12
81	End	E0	AA	E0	4F	E0	CF	E0	2A	E0	F0	12	E0	69	E0	F0	69	E0	12
83	↑	E0	AA	E0	48	E0	C8	E0	2A	E0	F0	12	E0	75	E0	F0	75	E0	12
84	↓	E0	AA	E0	50	E0	D0	E0	2A	E0	F0	12	E0	72	E0	F0	72	E0	12
85	PgUp	E0	AA	E0	49	E0	C9	E0	2A	E0	F0	12	E0	7D	E0	F0	7D	E0	12
86	PgDn	E0	AA	E0	51	E0	D1	E0	2A	E0	F0	12	E0	7A	E0	F0	7A	E0	12
89	→	E0	AA	E0	4D	E0	CD	E0	2A	E0	F0	12	E0	74	E0	F0	74	E0	12
203	Win	E0	AA	E0	5B	E0	DB	E0	2A	E0	F0	12	E0	1F	E0	F0	1F	E0	12
204	App	E0	AA	E0	5D	E0	DD	E0	2A	E0	F0	12	E0	2F	E0	F0	2F	E0	12

Note : The table above shows scan codes with the left **Shift** key. In combination with the right **Shift** key, scan codes are changed as listed below:

	With left **Shift**	With right **Shift**
Set 1	E0 AA____________	E0 B6
	E0 2A ____________	E0 36
Set 2	E0 F0 12 _________	E0 F0 59
	E0 12 ____________	E0 59

Table D-3 Scan codes in Numlock mode

Cap No.	Key top	Code set 1								Code set 2										
		Make				Break				Make				Break						
75	INS	E0	2A	E0	52	E0	D2	E0	AA	E0	12	E0	70	E0	F0	70	E0	F0	12
76	DEL	E0	2A	E0	53	E0	D3	E0	AA	E0	12	E0	71	E0	F0	71	E0	F0	12
79	←	E0	2A	E0	4B	E0	CB	E0	AA	E0	12	E0	6B	E0	F0	6B	E0	F0	12
80	Home	E0	2A	E0	47	E0	C7	E0	AA	E0	12	E0	6C	E0	F0	6C	E0	F0	12
81	End	E0	2A	E0	4F	E0	CF	E0	AA	E0	12	E0	69	E0	F0	69	E0	F0	12
83	↑	E0	2A	E0	48	E0	C8	E0	AA	E0	12	E0	75	E0	F0	75	E0	F0	12
84	↓	E0	2A	E0	50	E0	D0	E0	AA	E0	12	E0	72	E0	F0	72	E0	F0	12
85	PgUp	E0	2A	E0	49	E0	C9	E0	AA	E0	12	E0	7D	E0	F0	7D	E0	F0	12
86	PgDn	E0	2A	E0	51	E0	D1	E0	AA	E0	12	E0	7A	E0	F0	7A	E0	F0	12
89	→	E0	2A	E0	4D	E0	CD	E0	AA	E0	12	E0	74	E0	F0	74	E0	F0	12
203	Win	E0	2A	E0	5B	E0	DB	E0	AA	E0	12	E0	1F	E0	F0	1F	E0	F0	12
204	App	E0	2A	E0	5D	E0	DD	E0	AA	E0	12	E0	2F	E0	F0	2F	E0	F0	12

Table D-4 Scan codes with Fn key

Cap No.	Keytop	Code set 1				Code set 2				
		Make		Break		Make		Break		
43	ENT	E0	1C	E0	9C	E0	5A	E0	F0	5A
58	CTRL	E0	1D	E0	9D	E0	14	E0	F0	14
60	LALT	E0	38	E0	B8	E0	11	E0	F0	11
121	ARROW	45		C5		77		F0	77	
122	NUMERIC	45		C5		77		F0	77	
123	Scrl	46		C5		7E		F0	7E	

Table D-5 Scan codes in overlay mode

Cap No.	Keytop		Code set 1		Code set 2	
			Make	Break	Make	Break
08	7	(7)	47	C7	6C	F0 6C
09	8	(8)	48	C8	75	F0 75
10	9	(9)	49	C9	7D	F0 7D
11	0	(*)	37	B7	7C	F0 7C
23	U	(4)	4B	CB	6B	F0 6B
24	I	(5)	4C	CC	73	F0 73
25	O	(6)	4D	CD	74	F0 74
26	P	(–)	4A	CA	7B	F0 7B
37	J	(1)	4F	CF	69	F0 69
38	K	(2)	50	D0	72	F0 72
39	L	(3)	51	D1	7A	F0 7A
40	;	(+)	4E	CE	79	F0 79
52	M	(0)	52	D2	70	F0 70
54	.	(.)	53	D3	71	F0 71
55	/	(/)	E0 35	E0 B5	40 4A	E0 F0 4A

Table D-6 No.124 key scan code

Key top	Shift	Code set 1		Code set 2	
		Make	Break	Make	Break
Prt Sc	Common	E0 2A E0 37	E0 B7 E0 AA	E0 12 E0 7C	E0 F0 7C E0 F0 12
	Ctrl +	E0 37	E0 B7	E0 7C	E0 F0 7C
	Shift +	E0 37	E0 B7	E0 7C	E0 F0 7C
	Alt +	54	D4	84	F0 B4

Table D-7 No.126 key scan code

Key top	Shift	Code set 1	Code set 2
		Make	Make
Pause	Common*	E1 1D 45 E1 9D C5	E1 14 77 E1 F0 14 F0 77
	Ctrl*	E0 46 E0 C6	E0 7E E0 F0 7E

*: This key generates only make codes.

Appendix E Key Layout

E.1 United States (US) Keyboard



Figure E-1 US keyboard

E.2 Japan (JP) Keyboard

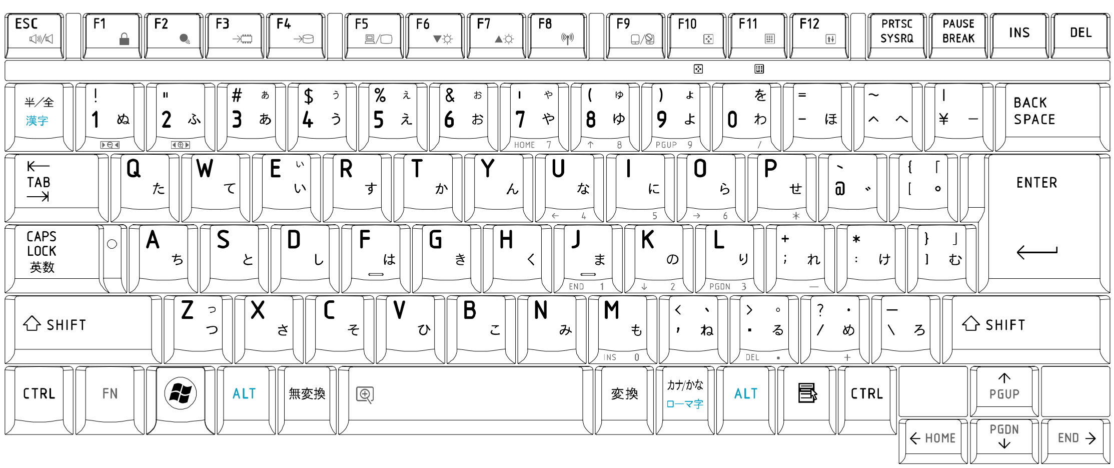


Figure E-2 JP keyboard

E.3 Spanish (SP) Keyboard



Figure E-3 SP keyboard

E.4 Korean (KR) Keyboard

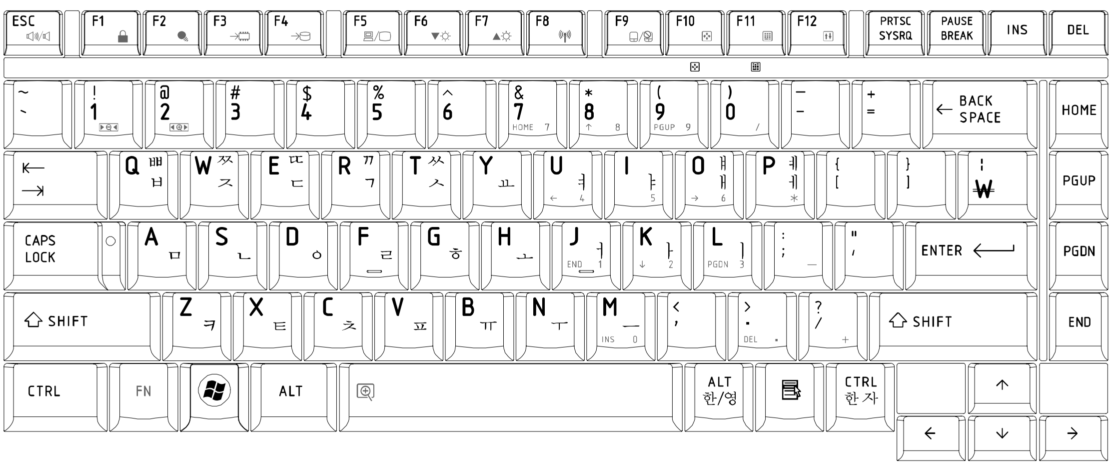


Figure E-4 KR keyboard

E.5 Canadian Bilingual (QB) Keyboard



Figure E-5 QB keyboard

E.6 French (FR) Keyboard

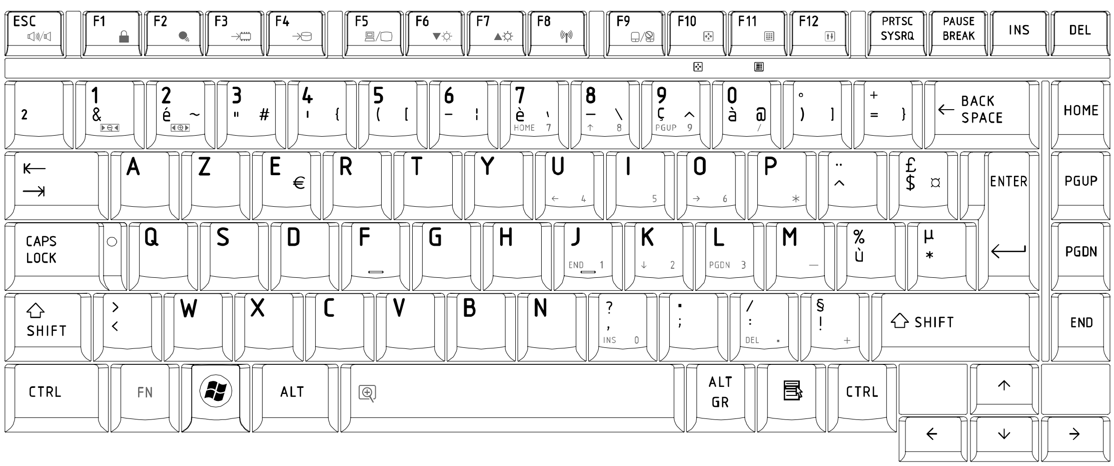


Figure E-6 FR keyboard

E.7 German (GR) Keyboard



Figure E-7 GR keyboard

E.8 Italian (IT) Keyboard

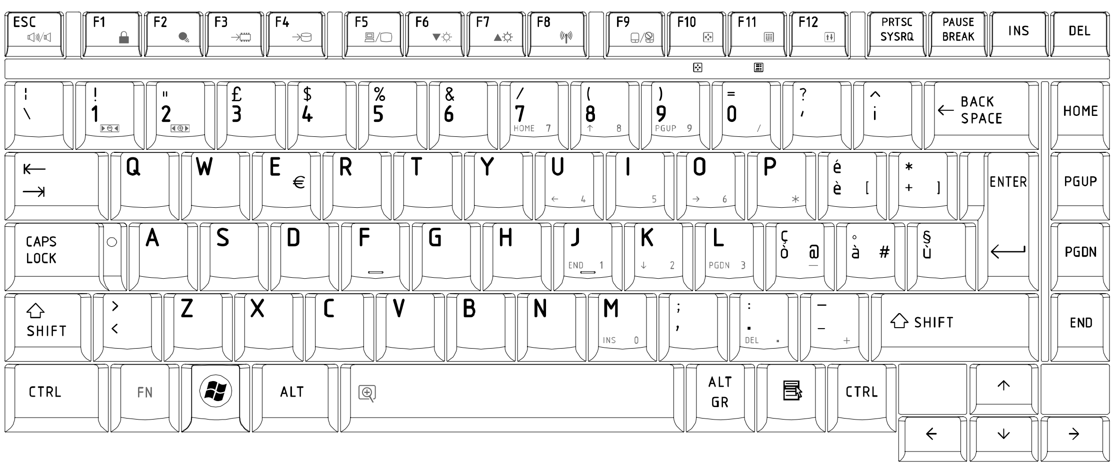


Figure E-8 IT keyboard

E.9 Taiwan (TC) Keyboard

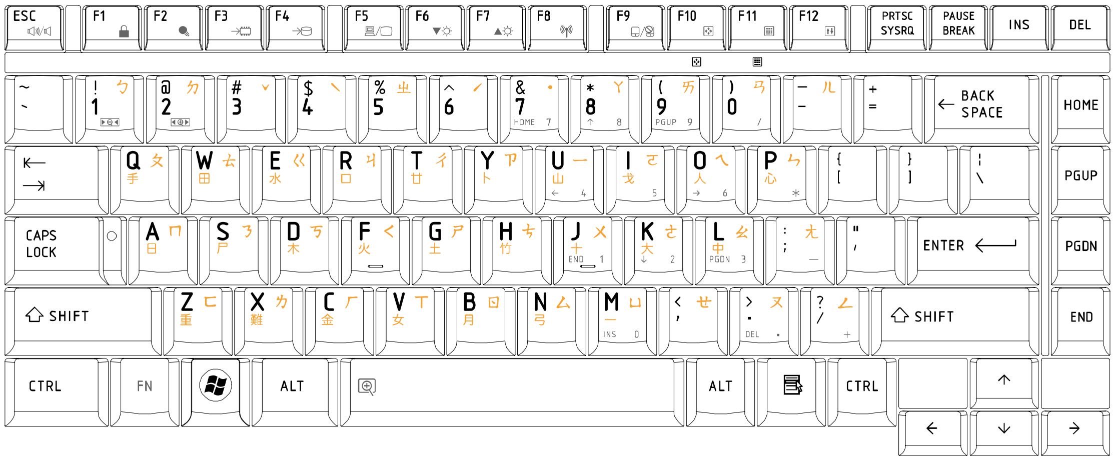


Figure E-9 TC keyboard

E.10 Portuguese (PT) Keyboard

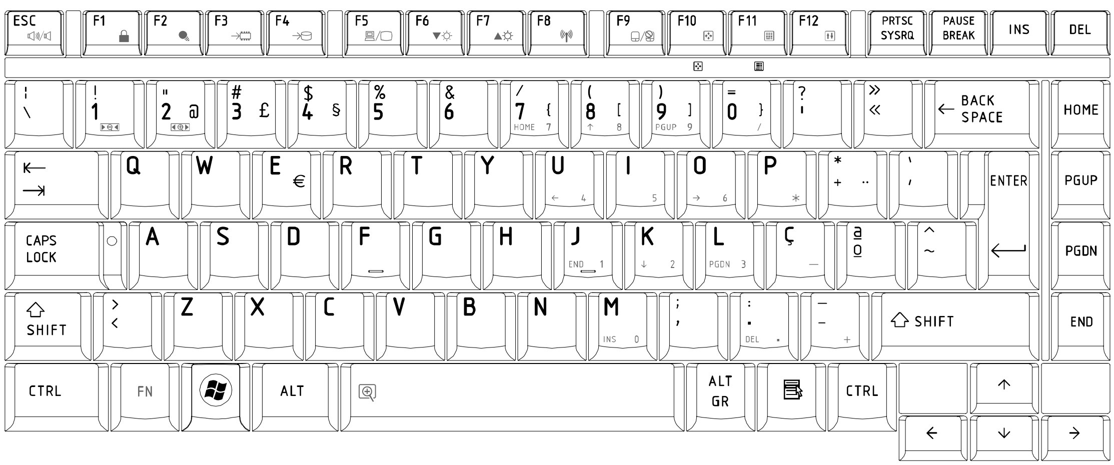


Figure E-10 PT keyboard

E.11 DU, UE, US International (USE) Keyboard



Figure E-11 USE keyboard

E.12 Arabic (AR) Keyboard

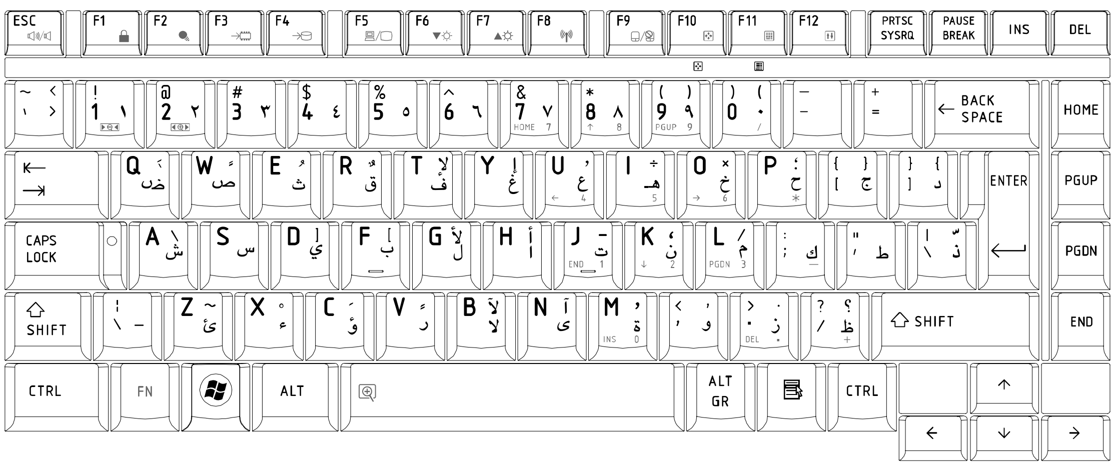


Figure E-12 AR keyboard

E.13 Belgian (BE) Keyboard



Figure E-13 BE keyboard

E.14 Russian (RU) Keyboard

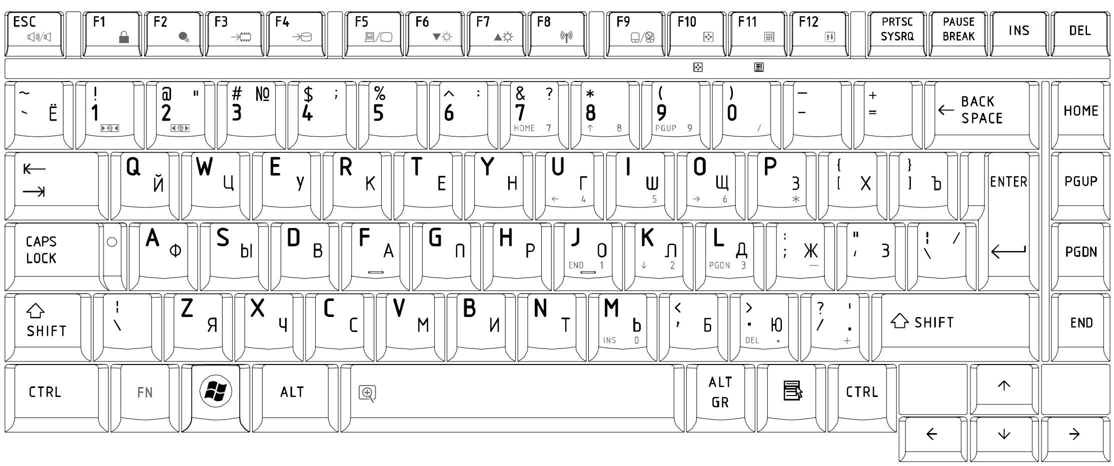


Figure E-14 RU keyboard

E.15 Swiss/Switzerland (SL) Keyboard



Figure E-15 SL keyboard

E.16 Swedish (SW) Keyboard

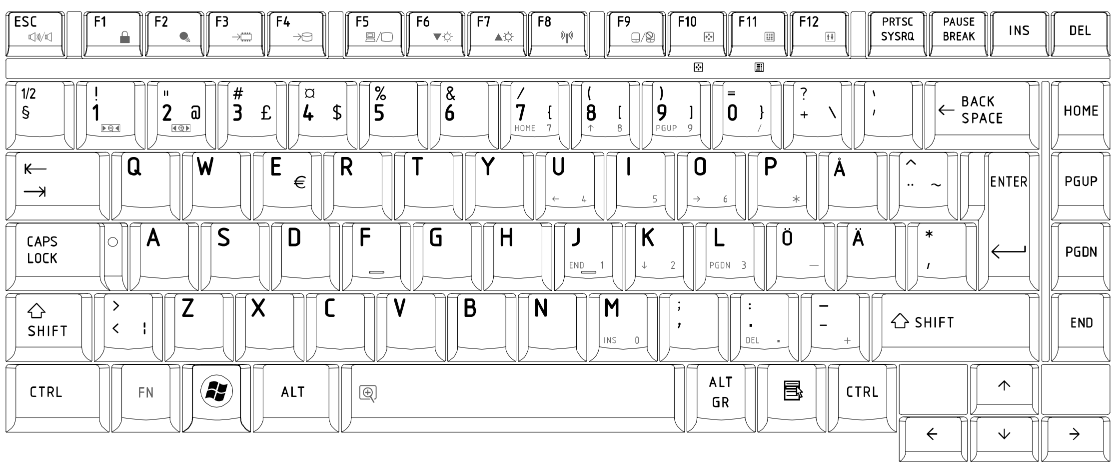


Figure E-16 SW keyboard

E.17 Norwegian (NO) Keyboard



Figure E-17 NO keyboard

E.18 Danish (DK) Keyboard

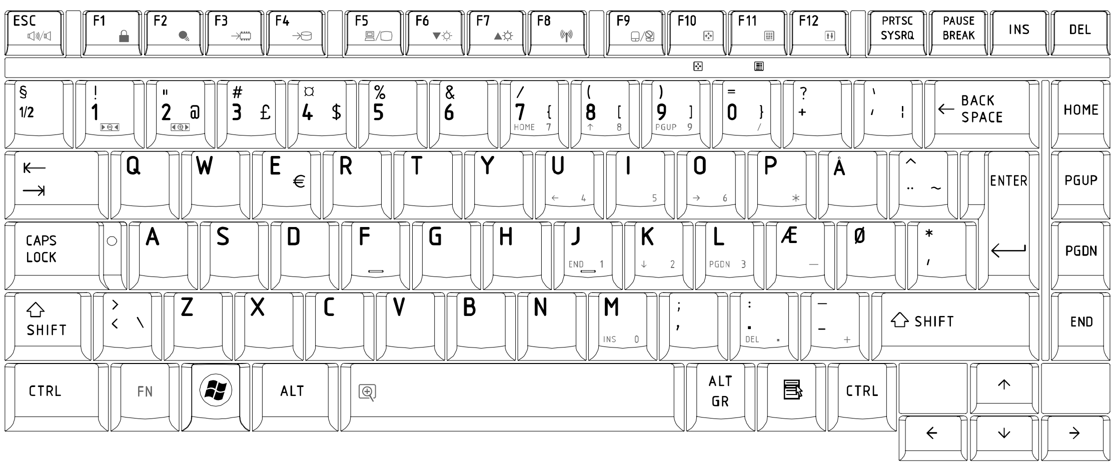


Figure E-18 DK keyboard

E.19 Turkey (TR) Keyboard



Figure E-19 TR keyboard

E.20 Greek (GK) Keyboard

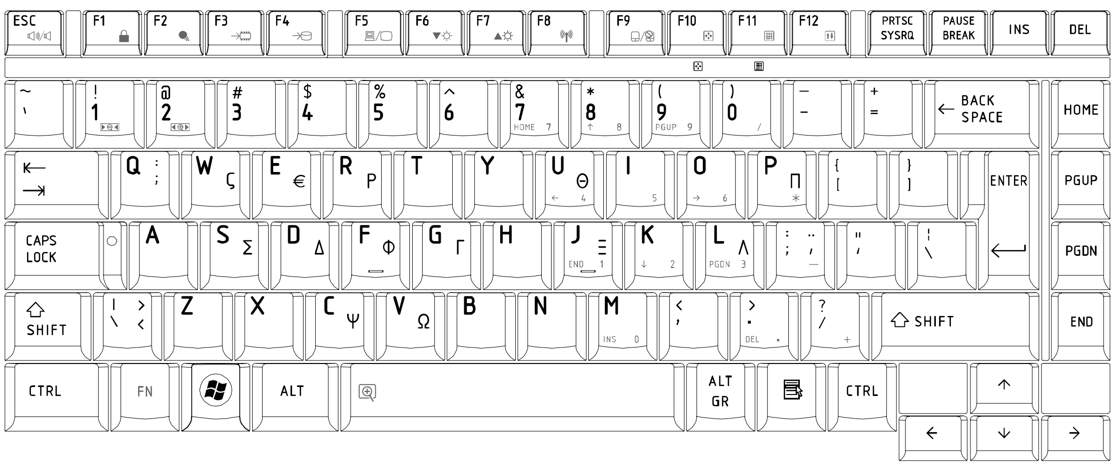


Figure E-20 GK keyboard

E.21 Canadian Multinational (CM) Keyboard

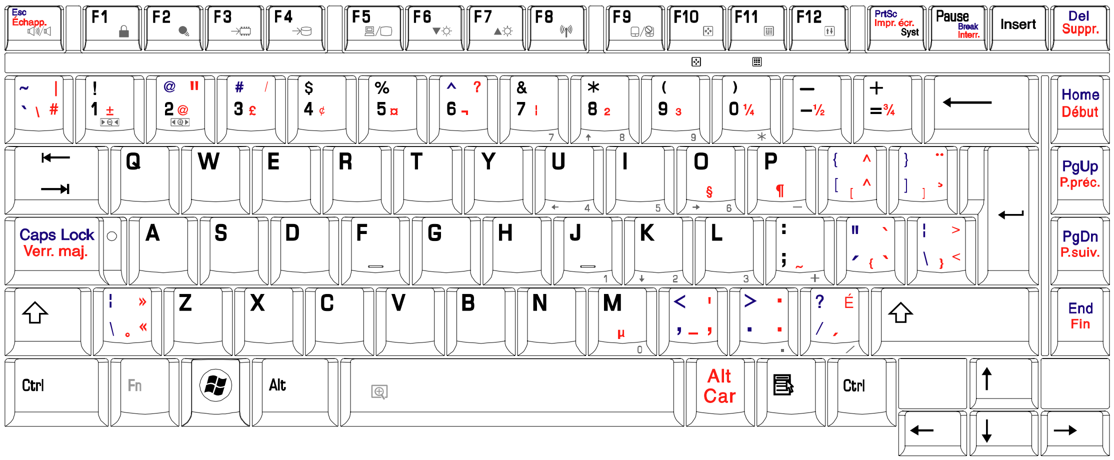


Figure E-21 CM keyboard

E.22 Herbrew (HE) Keyboard

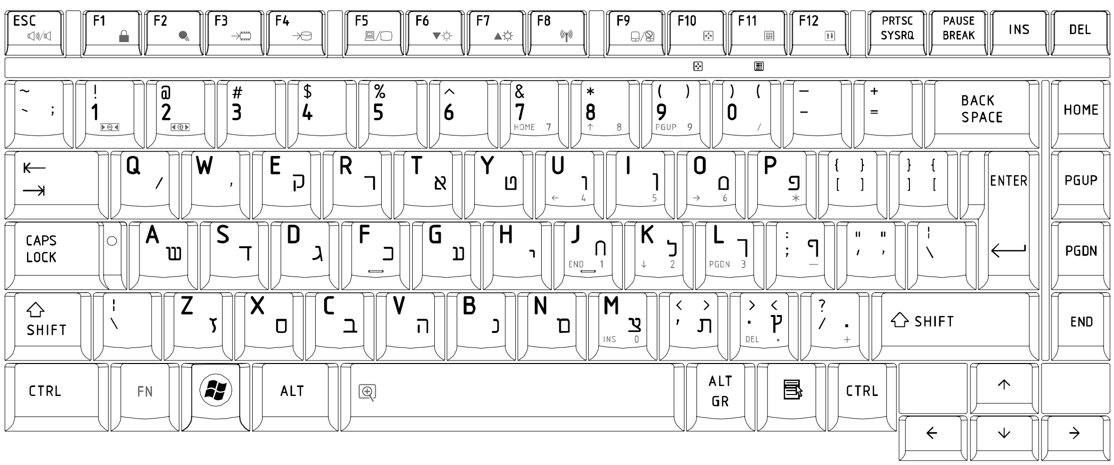


Figure E-22 HE keyboard

E.23 Czech (CZ) Keyboard



Figure E-23 CZ keyboard

E.24 Scandinavian (N5) Keyboard

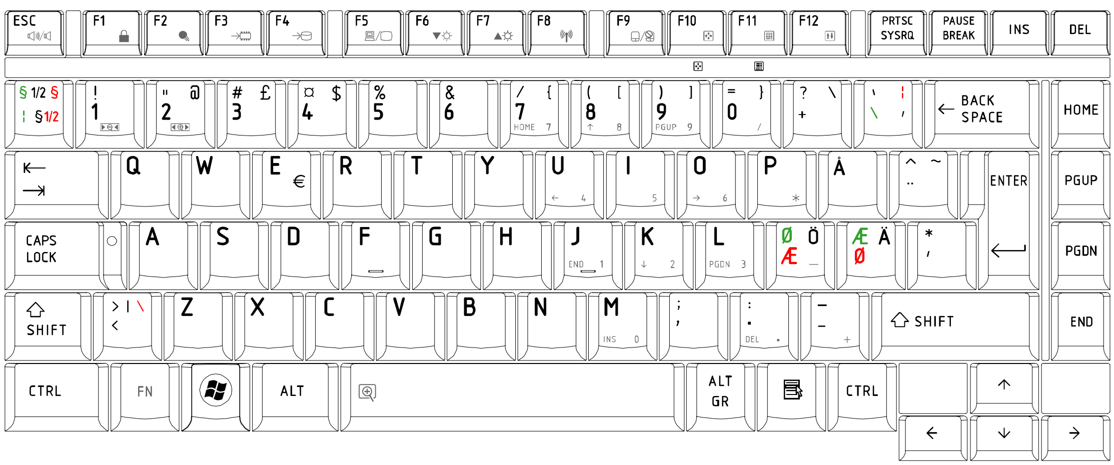


Figure E-24 N5 keyboard

E.25 Hungary (HU) Keyboard



Figure E-25 HU keyboard

E.26 Slovakian (SK) Keyboard

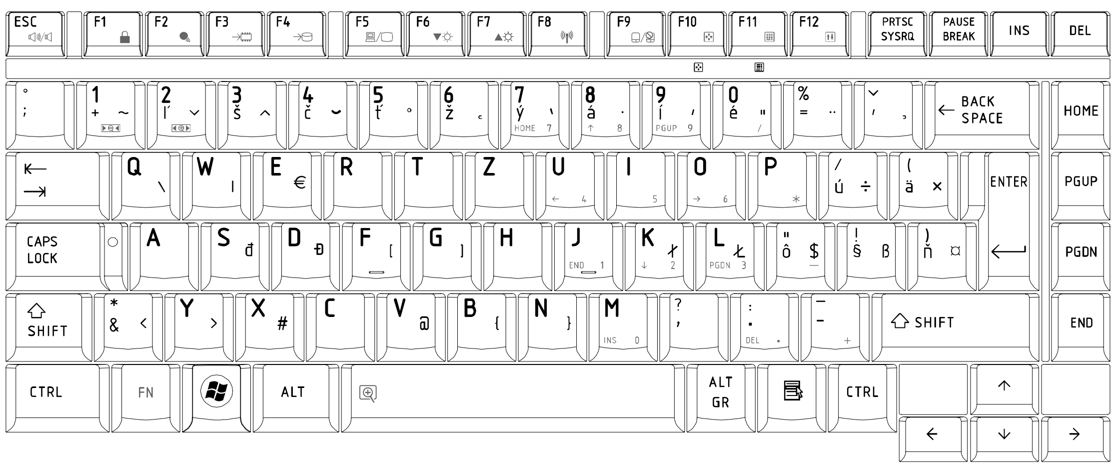


Figure E-26 SK keyboard

E.27 Yugoslavia (YU) Keyboard



Figure E-27 YU keyboard

E.28 Thai (TH) Keyboard

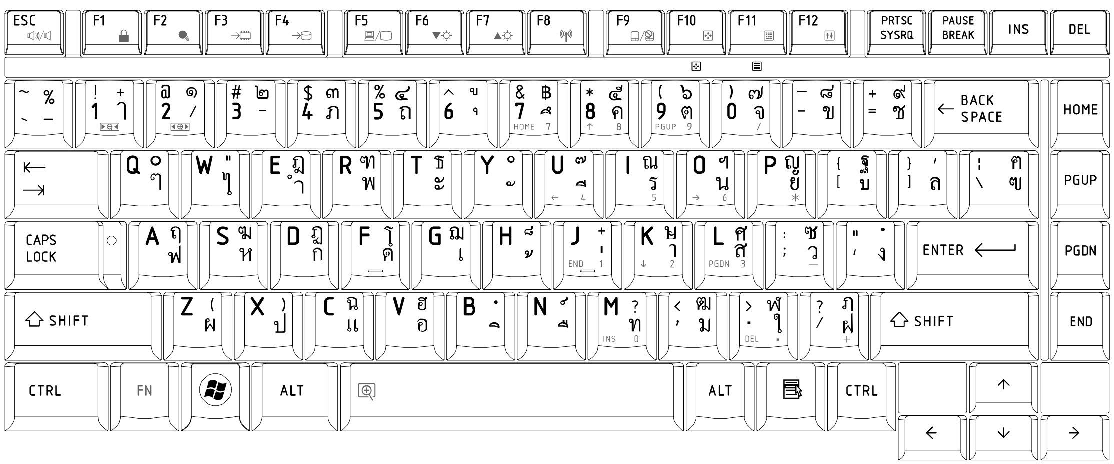


Figure E-28 TH keyboard

E.29 United Kingdom (EN) Keyboard



Figure E-29 EN keyboard

E.30 Turkish F (TF) Keyboard

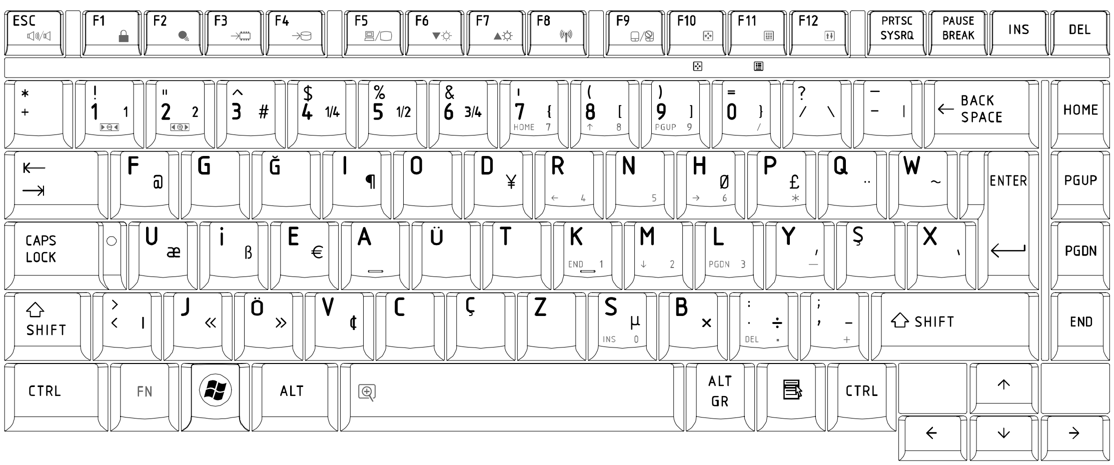


Figure E-30 TF keyboard